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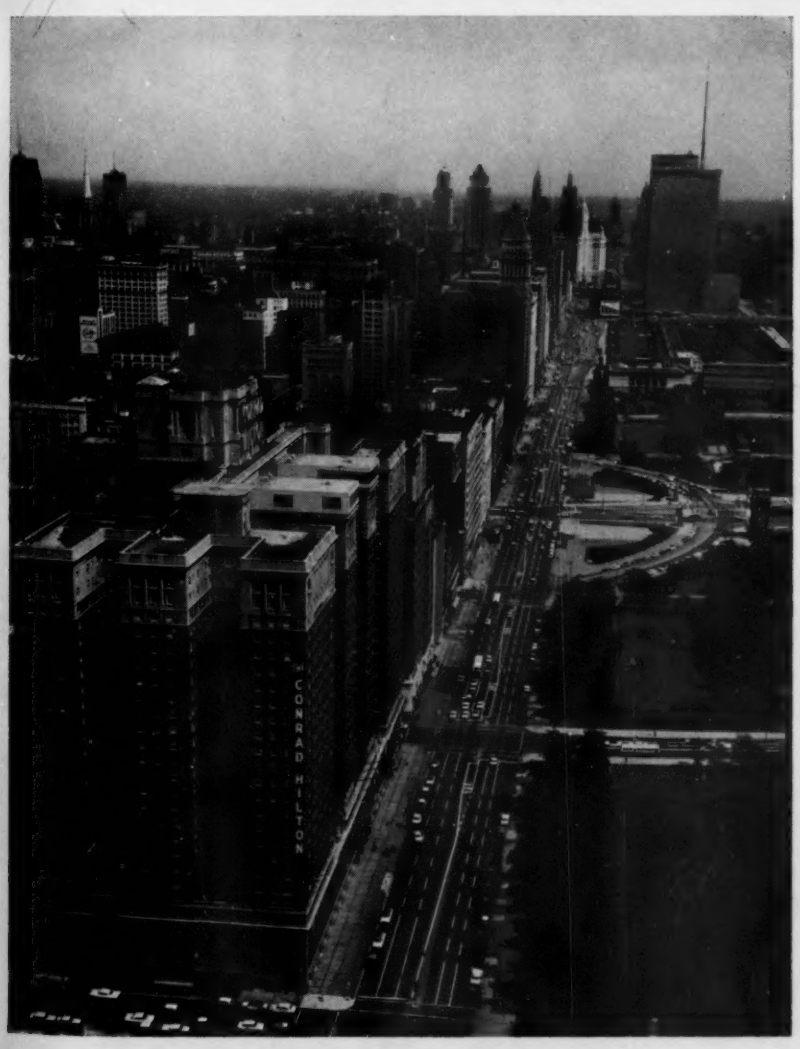
Heating • Refrigerating • Air Conditioning • Ventilating

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS



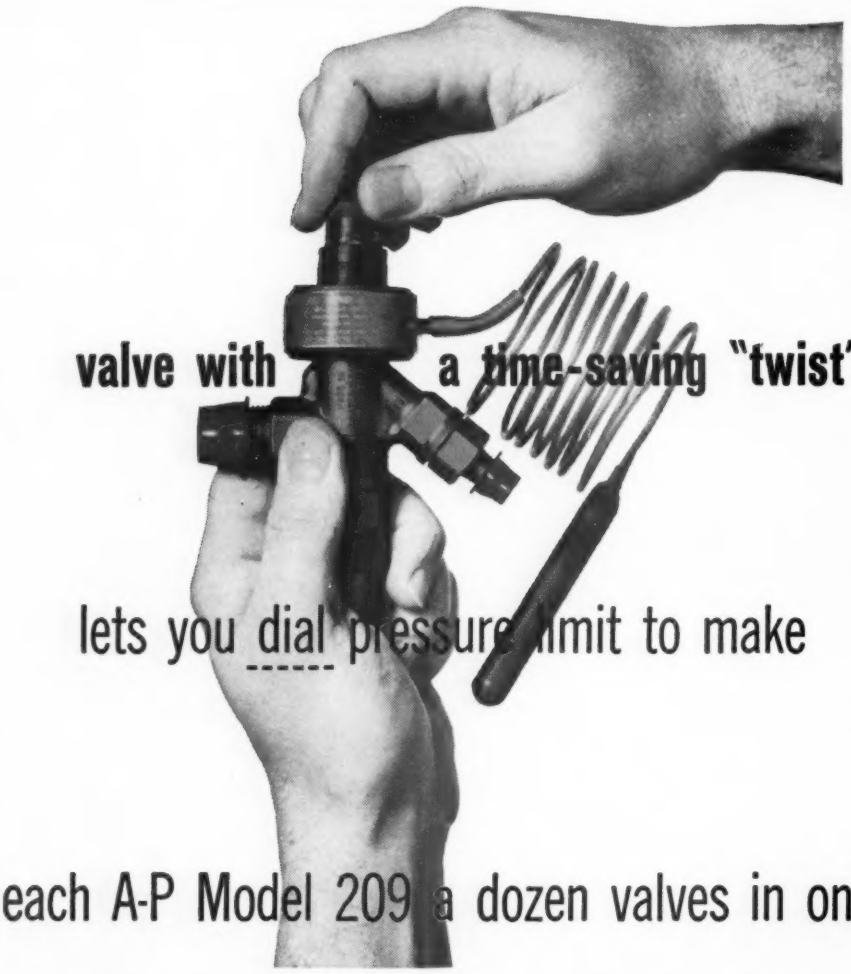
ASHRAE to hold Semiannual Meeting Chicago February 13-16

In this Preview Issue

Meeting Program

Abstracts of technical sessions and symposium papers

JANUARY 1961



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JANUARY 1961

OFFICIAL PUBLICATION

ASHRAE JOURNAL

VOL. 3 NO. 1

Formerly Refrigerating Engineering including Air Conditioning, and incorporating the ASHAE Journal.

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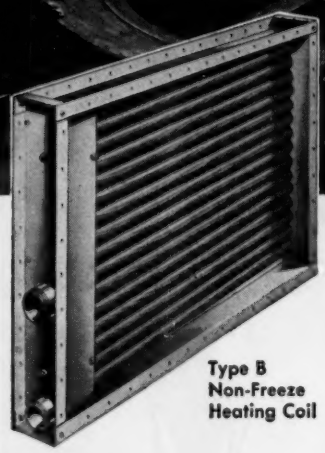

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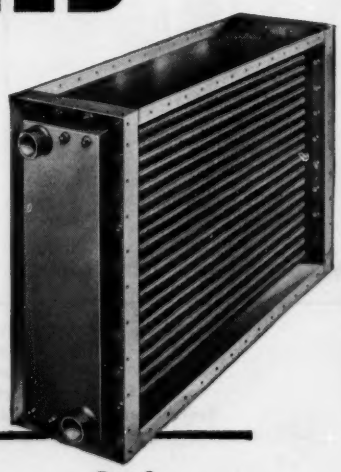

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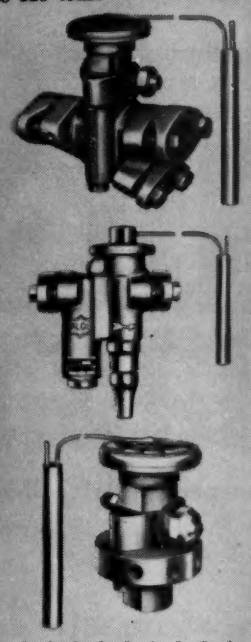

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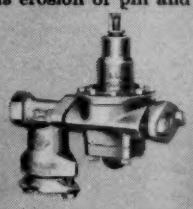

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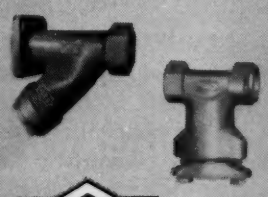

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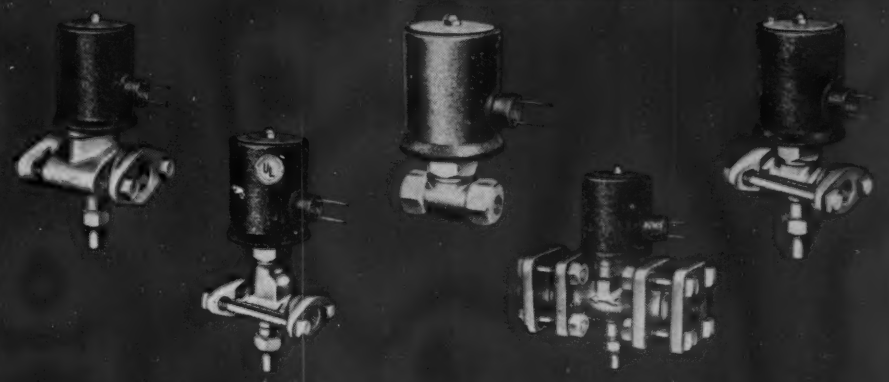
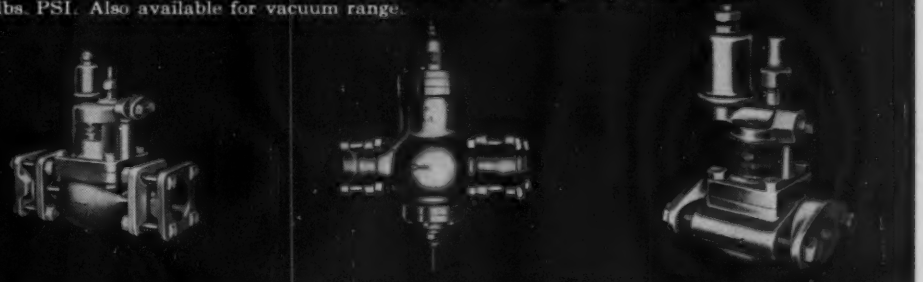


Explosion proof solenoid valves available.

EVAPORATOR PRESSURE REGULATORS

for constant evaporator pressure or temperature. Operating range 2 lbs. to 70 lbs. PSI. Also available for vacuum range.



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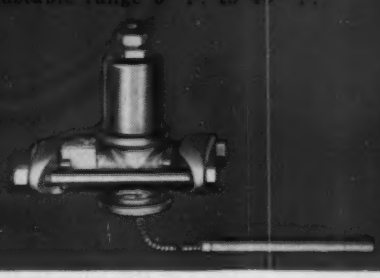
for control of evaporator temperature. Adjustable range 0° F. to 40° F.



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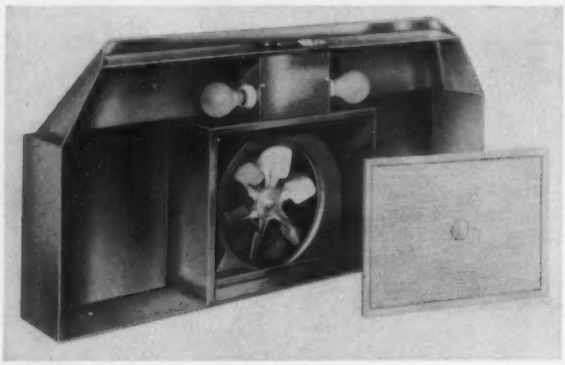
PARTS AND PRODUCTS

RANGE HOOD

Featured on the new 5200 Series range hood is a two-speed high pressure fan that develops enough power to overcome the static resistance of long runs of 3¼ x 10-in. duct. Hood can be ducted from the back or top. Control panel of the unit is centered in the front and has two push buttons, one controlling the fan



motor, the other the two-bulb light. Cleanable aluminum filter measures 10 x 14 in.

Four sizes are available – 24, 30, 36 and 42 in. wide.

Leigh Building Products Div, Air Control Products, Inc., Coopersville, Mich.

FREEZER DISPLAY CASE

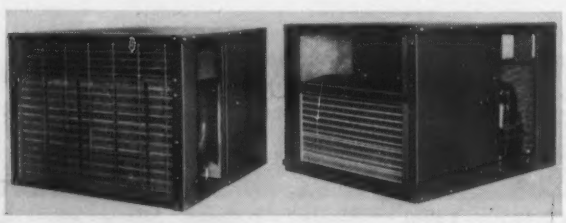
Design of this unit is such that it can be used in many different locations in retail stores, and either singly or with two or more units butted together as a center island display. Capacity of Model CI-68 is 12.7 cu ft; the freezer measures 68 in. long, 36 in. deep and 36 in. high.

Refrigerated by a one-hp quiet-operating condensing unit, Model CI-68 is constructed of all-steel finished with acid-resistant porcelain. Condensing unit is mounted on a pull-out base to make it accessible for fast and easy service. An evaporative drain pan located in the condensing unit compartment eliminates the need for plumbing connections.

Bally Case and Cooler, Inc., Bally, Pa.

1961 AIR CONDITIONERS

Two and three-hp sizes of a new Luxaire self-contained, air-cooled summer air conditioning unit will



be available early in 1961. Housed in a single cabinet for location inside a building, in an attic, basement or crawl space, or outside a building with ducts projecting inside, the unit is designed for installation with air distribution ducts and can be used in combination with a forced air furnace for year round air conditioning. Condenser end of the air conditioner is shown at left in the illustration, evaporator end at right.

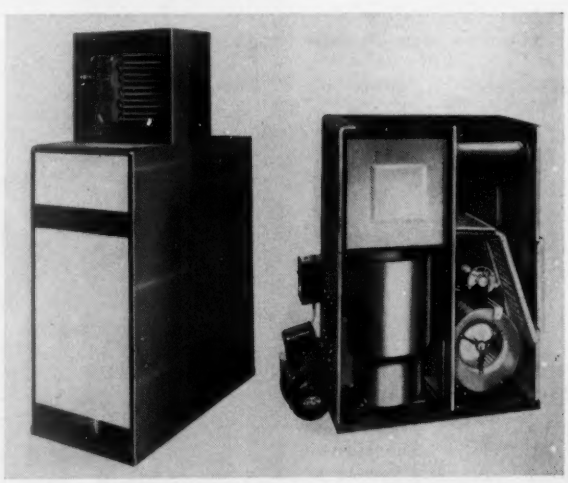
Compressor, condenser coil, centrifugal condenser blower and motor are housed in a separate compartment at one end of the cabinet. Condenser air intake and discharge are made through a common protective grille that is extended through a wall of the building. Evaporator coil, centrifugal evaporator blower and blower motor are contained in a second compartment at the opposite end of the cabinet, where the conditioned air discharge and intake ducts are connected to flanges provided.

Cooling capacity of the two-hp size is 23,000 Btu/hr; that of the three-hp size is 35,000 Btu/hr, under standard conditions of 80 F dry bulb and 67 F wet bulb across the evaporator coil and 95 F across the condenser coil.

C. A. Olsen Manufacturing Company, Elyria, Ohio.

OIL FURNACES

Three sizes of these new furnaces – 84,000, 95,000 and 112,000 Btu/hr output at the bonnet – will be assembled and internally wired at the factory and will be

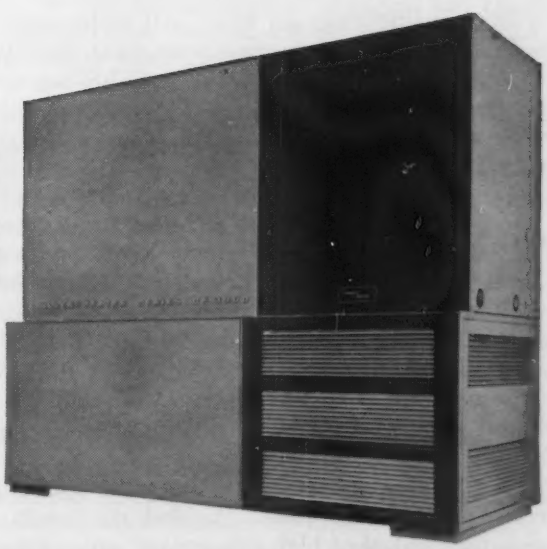


offered with a choice of cabinet styles, one having the burner exposed and the other with a vestibule concealing the burner. A larger, 140,000 Btu/hr output, size will be shipped unassembled and offered with the vestibule cabinet only. At left in the illustration the unit is shown with burner-concealing vestibule. Installed in the discharge air plenum is the evaporator coil of a summer air conditioner. Interior of a furnace with the oil burner exposed is shown at the right.

High air deliveries, permitting addition of a summer air conditioning cooling coil, are achieved with standard equipment blowers. These blowers are large enough to produce air deliveries for any capacity of cooling which it is practical to add to the furnaces. Implementing quiet performance is a heavy gauge heat exchanger with a round combustion chamber lined with a heavy-duty, refractory firebox. A large

A MAJOR BREAKTHROUGH IN COOLING & HEATING

ARKLA'S NEW 25-TON GAS CHILLER-HEATER



Here it is—the revolutionary new Arkla absorption unit that heats and cools without a steam producing boiler or converter. Gas-fired burners in the generator section energize the system for absorption cooling, or for heating. It's the perfect system for modern year 'round gas air conditioning.

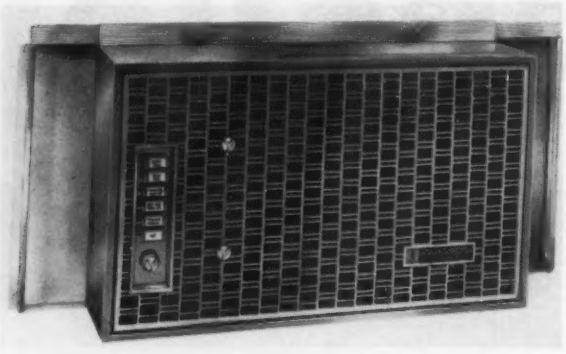
INSTANTLY HEATS AND COOLS AUTOMATICALLY ■ HEATS WATER WITHOUT A BOILER ■ COOLS WATER WITHOUT A COMPRESSOR ■ REQUIRES NO LUBRICATION ■ SEALED FOR LIFE, REQUIRING MINIMUM MAINTENANCE ■ MAINTAINS SAME CAPACITY FOR THE LIFE OF THE UNIT ■ HAS NO MOVING PARTS IN THE HEATING AND COOLING CYCLE ■ FIRST MEDIUM OR LARGE TONNAGE AIR CONDITIONER THAT HEATS. Truly revolutionary . . . investigate for your next building project the new Arkla DF-3000 Gas-fired All Year® Chiller-Heater. For details contact your local Gas Company. Or write Arkla Air Conditioning Corporation, 812 Main Street, Little Rock, Arkansas. *American Gas Association*

FOR HEATING & COOLING GAS IS GOOD BUSINESS!

rectangular radiator with the flue tube extending through the blower compartment provides long travel of the flue gases for maximum heat extraction.
Henry Furnace Company, Medina, Ohio.

1961 AIR CONDITIONERS

Versatility of installation, either in a casement or double-hung window, as desired, is provided by Model 7A9C, a new development of this manufac-



turer. Cooling capacity of this one-hp unit is 7000 Btu/hr. It is equipped with staggered coils, squirrel-cage pressure-type blower fans, two-speed fan motor, single selector switch to control all air conditioning functions, automatic thermostat, permanent filter and a heavy zinc-coated steel cabinet.

Also announced was the 1961 line of Quiet Kool air conditioners, covering a range of models with cooling capacities from 7000 to 16,000 Btu/hr, and reverse cycle heat pump units. Incorporated in the series are a shock-mounted compressor, twin squirrel-cage pressure-type blower wheels, staggered tube coil systems, automatic thermostat and slide-out permanent cleanable room air filter. All major metal parts are constructed of corrosion-resistant, heavy zinc-coated steel. Models are also available for through-the-wall installation.
Emerson Radio & Phonograph Corporation, Jersey City 2, N. J.

SIDEWALL REGISTERS

Designated Series 10V sidewall registers, these new shallow-valve units are available in four sizes covering installation requirements from 8 x 6 to 14 x 6 in. Face vanes are set at a 45 deg angle and ½ in. apart, for widespreading, two-way vertical deflection. A multi-louver damper is cited as assuring precise upward and downward throw, controlled by positive-action lever. Shallow valve design simplifies installation on conventional stackheads. Welded construction permits full control of high velocity air without a whistle or rattle.
Lima Register Company, Lima, Ohio.

AIR DRYER

Consisting of a small refrigeration compressor (Model P61H) with a thermal mass-type heat exchanger, Model 101AD can dehumidify 100 psig air to 12 F min dewpoint atmosphere at rated 10 scfm. Designed for wall mounting, it is supported by two bolts through keyhole slots in the back of the case. Provided for plugging into a wall receptacle is a six-ft heavy duty cord. For optimum dehumidification, compressed air to the unit is taken directly from the receiver of the air compressor, ahead of any pressure reducing valve. An inverted bucket-type trap is provided with the dryer for installation in the drain line for automatic condensate removal.

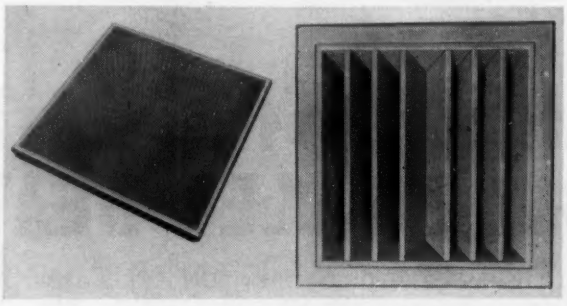
Heat exchanger used with the unit incorporates a number of desirable features. Refrigerant and air coils are surrounded by a heat conductive material of considerable mass. Due to this, a substantial flow of compressed air through the exchanger results in only a small temperature rise of the exchanger media. Provided by this is a flywheel effect, and compressed air is cooled to a nearly constant temperature regardless of fluctuating air volumes passing through the exchanger. Temperature is controlled by a thermal switch situated in a protective well located in the thermal media.

Incorporated in the heat exchanger is a centrifuge-filter unit designed to prevent blow-by of condensed moisture into the compressed air leaving line. Center core of the exchanger is insulated fully to minimize ambient load and keep atmospheric condensation within the cabinet normal.
Zeks Industries, Inc., P. O. Box 435, Haverford, Pa.

CEILING DIFFUSERS

Added to the Kno-Draft line are two new ceiling diffusers, Type KO perforated and Type KSS vari-pattern. Standard finish for the diffusers is baked enamel.

Available in both square and rectangular designs, Type KO is styled simply and integrates neatly with acoustical ceiling tiles. Type KSS offers a variety of air pattern arrangements to satisfy different applica-



tion and installation requirements. Square or rectangular configurations are available in a range of sizes.
Connor Engineering Corporation, Danbury, Conn.

ELECTRONIC AIR FILTER

High efficiency of Electro-Klean operation has been advanced in the 1961 model with a greater refinement of the electrostatic printed circuit in the filter cells. Up to 90% of all air-borne dirt, dust and pollen is cited as being trapped and held.

Installed in the return air duct of any forced air furnace or central air conditioner, the unit requires

(*Continued on page 22*)

News highlights of the month

TRENDS

Hot machining Research by Assistant Professor Pentland of the Sibley School of Mechanical Engineering, Cornell, indicates that metals machined within the 73-1200 F range may be worked with considerable increase in efficiency in the removal of metal by the cutting tools. Specifically, tool life is increased many times over that obtained at room temperatures. No detectable changes in microstructure was apparent over hot-machined specimens and the surface finish was cited as being as good or better than at room temperature.

Gas industry exhibit Jointly sponsored by the American Gas Association and the Gas Appliance Manufacturers Association, there will be a $5,500,000 exhibit of that industry at the 1964-1965 New York World's Fair. The exhibit will occupy about 60 per cent of the 50,000 sq ft leased by the gas industry at the Flushing Meadows fair grounds.

OHI-NFOC "Current progress toward formation of a single overall national organization to foster the interests of oil heat is a most encouraging development," states Managing Director Charles H. Burkhart of OHI. "Negotiations between the Oil Heat Institute and the National Fuel Oil Council are proceeding at a quickening pace."

Time-Temperature Tolerance Review of 1948-initiated Time-Temperature Tolerance investigations was afforded at a frozen food industry meeting in November at the Western Regional Laboratory of the U. S. Department of Agriculture. Represented were the Frozen Foods All-Industry Coordinating Committee and the Association of Food and Drug Officials of the U. S. Emphasis continued to be placed on product quality and public health.

Frozen Food City To occupy a 3,100,000 cu ft, single story warehouse on a 25 acre tract, Frozen Food City in Secaucus, N. J., will be a project of Merchants Refrigerating Company, that consists of a freezer storage room (–10 F) and a cooler storage room (28-30 F). Automatic operation of the evaporator units with Refrigerant 12 and glycol solution over coil surfaces will be a feature.

TRRF low temperatures An initial grant of $4500 by The Refrigeration Research Foundation to Colorado College puts TRRF into low temperature studies. Biological and other materials will be subject to the full lower level of 450 below zero F in the Cryogenic pattern. Colorado College departments of zoology and chemistry are to cooperate with much of the work on a special project basis. Dr. Wilbur H. Wright, professor of physics at Colorado College will direct the studies.

SPECIAL MEETINGS

Temperature Symposium To be held March 27-31 in Columbus, Ohio, the 1961 Symposium upon Temperature – its Measurement and Control in Science and Industry, will be sponsored by the American Institute of Physics, the Instrument Society of America and the National Bureau of Standards. The program is an ambitious one, covering the entire range of temperatures and will involve presentation of nearly 200 formally prepared papers. This is the fifth in a series of similar meetings, the first having been held in Chicago in 1919.

With anthracite For a Progress Report on efforts by various organizations to regain for Anthracite that economic importance which it once had, there was presented at Pennsylvania State University late in November a conference sponsored by representatives of Penn State, the Anthracite Institute, the Coal Research Board of Pennsylvania, the United Mine Workers of America and leading anthracite producers at Pennsylvania State Anthracite Institute. Explored were industrial uses for this fossil fuel at non-combustion points, some newer designs of stokers, the possible blending of anthracite with coking coals, and similar research.

Heat transfer Announcement has been made by the University of Southern California of the 1961 Heat Transfer and Fluid Mechanics Institute to be held June 19-21 in Los Angeles, sponsored by six California institutions of higher education and five professional engineering Societies, including ASHRAE. The forthcoming meeting will include papers upon boundary layer flow, stability and

equilibrium gas dynamics, low-density gas dynamics, magneto-fluid mechanics, measurement techniques, and thermal radiation.

BOOK REVIEWS

For schools Inclusive of heating, ventilating and air conditioning facilities, the "Mechanical-Electrical Equipment Handbook for School Buildings" is a 412-page guide to installation and maintenance practices. Authored by Harry Terry, consulting engineer. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. $9.50.

Graduate students As a guide to the engineering undergraduate who would continue his studies, a booklet "The Road to Graduate School" has been prepared by the Tau Beta Pi chapter at the University of Illinois, Urbana, Ill., and is available free to any undergraduate engineering student.

Truck-trailer data As compiled by the Truck-Trailer Manufacturers Association (710 Albee Building, Washington 5, D. C.) data regarding state motor vehicle regulations for permissible dimensions offer a guide to present rules as well as to trends. President C. W. Alexander sponsors a published statement related also to thermal insulation and refrigeration practices.

Pure air for buildings Publication 797 of the Building Research Institute (2101 Constitution Avenue N.W., Washington 25, D. C.) is a 62-page report upon "Cleaning and Purification of Air in Buildings" as part of the 1960 BRI Spring Conferences.

Teacher income Analysis of a study undertaken by the Engineering Manpower Commission in cooperation with the American Society for Engineering Education as reported upon in a 32-page booklet – "1960 Salary and Income of Engineering Teachers." Tabulated and charted results dramatize the findings reported in the text, available from the Engineering Manpower Commission, 29 West 39th Street, New York 18, N. Y.; 25c a copy.

Hydronics Within a 30-page summary, prepared by Professor Warren S. Harris of the University of Illinois, on behalf of the Institute of Boiler and Radiator Manufacturers, are reviewed various problems of hydronics. Specifically, the report summarizes results obtained in the course of the cooperative research program in steam and water heating and summer cooling, which has been carried out at the University since 1940. Available from the University of Illinois, Urbana, Ill., on request.

Solar energy news Prepared by Arizona State University under contract with the U.S. Signal Corps, the SEIC Newsletter provides monthly solar energy information to a selected group interested in related matters of science, engineering and development. Applications to receive should be addressed to Commanding Officer, U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J.

N.Y.U. Research Documenting the work of the Research Division of the College of Engineering of New York University in 1960, an annual report of 40 pages reviews in detail the projects of 12 divisions.

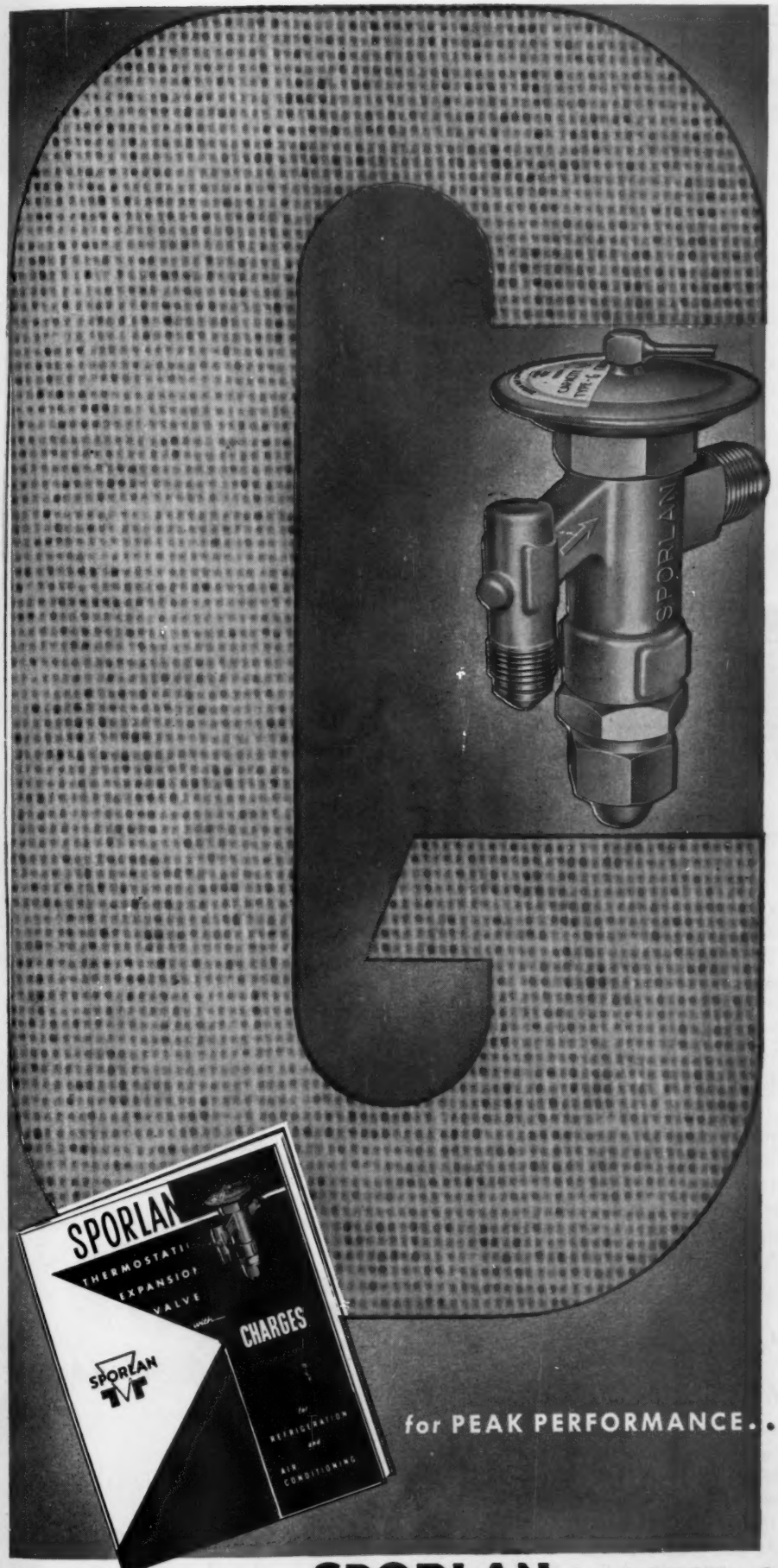
INDUSTRY CHANGES

Humidification study Adopting a study plan for the examination of controlled humidity during the heating season, the National Warm Air Heating and Air Conditioning Association will specifically explore the desired humidity range, factors affecting moisture requirements, procedures and measurement methods, available types of equipment and equipment selection considerations and recommendations. William H. Wentling (ASHRAE) is Chairman of NWAHACA's new Humidification group.

Water heating by oil An oil-fired water heater section has been added to the domestic and commercial-industrial sections of the Oil Heat Institute.

Short-haul buses Observing that "While air conditioning is a standard item in intercity buses it has not heretofore achieved full popularity in city service or for short suburban hauls," Karl Schuster of G.M.C.'s Truck and Coach Div. has pointed out that over 35 per cent of the 3500 new city and suburban buses built by GMC in the past 15 months have been ordered with air conditioning.

THERE'S AN INTENSIVE PROGRAM PLANNED
FOR OUR SEMIANNUAL MEETING PAGE 30



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for Suction Temperatures Above ZERO

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7525 SUSSEX AVENUE ST. LOUIS 17, MISSOURI

EXPORT DEPT. 85 BROAD STREET NEW YORK 4, N. Y.

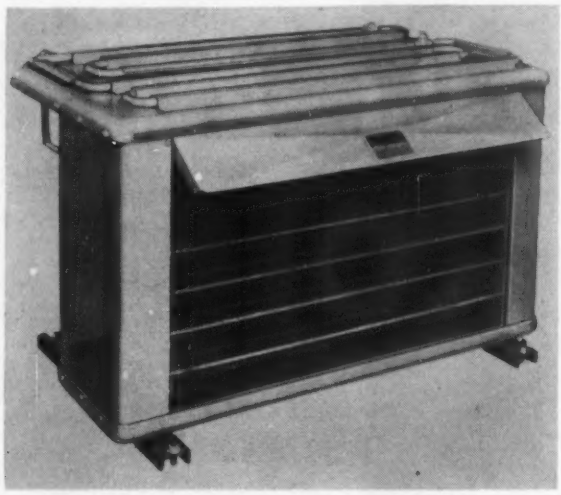
PARTS AND PRODUCTS

(*Continued from page* 16)

no plumbing or sewage connections or special electrical circuits. Filter cells are replaced every one or two years, depending upon local dirt conditions.
American Air Filter Company, 215 Central Ave., Louisville 8, Ky.

DEFROST SYSTEM

Incorporated in a new line of heat cycle defrost units is a completely automatic, time initiated, temperature terminated defrost system. Combined to produce a fast, safe and efficient defrost system are an inner fin



evaporator and a specially engineered heat cycle exchanger.

Super-heated discharge gas from the compressor passes through one side of the exchanger, enters the inner tube defrost circuit of the evaporator and defrosts the coil from the inside. Sub-cooled liquid refrigerant returning from the inner tube circuit of the evaporator passes through the other side of the heat cycle exchanger where it is boiled off before returning to the compressor, insuring against liquid returning to the compressor during the defrost cycle and eliminating consequent motor overload.

When defrosting is complete, a temperature sensitive switch (located on the evaporator) terminates the defrost cycle and then provides the necessary fan delay before returning to the normal refrigeration cycle.
Dunham-Bush, Inc., 179 South St., West Hartford 10, Conn.

WALL VENT HEATERS

Input range of this line of heaters is increased from 18,000 to 33,000 Btu/hr by addition of a new model for 1961. Prime features are fast installation and simplified direct venting through any outside wall. Four different models, for either recessed or flush installation, are included. Units extend only 5¾ in. into the room if recessed, 9 in. if flush mounted. A large, removable panel at the lower front makes cleaning easy and all controls are recessed behind a hinged side panel.
Pioneer Manufacturing Company, 3131 San Fernando Rd., Los Angeles 65, Calif.

RETURN AIR GRILLES

Rounding out a line of all-nylon registers, grilles and diffusers are these return air grilles based on a modular concept. Unbreakable, non-corrosive, non-combustible square module sections are injection molded in one piece with vanes set at a 30 deg angle. In grilles larger than six-in. square, the modules are mounted in aluminum mullion channels, permitting build-up in six-in. increments, in sizes up to 36 x 24 in.

By sliding the modules out of the channels, they may be turned in the opposite direction and re-inserted to provide two sizes in each grille. For example, a horizontal 24 x 18-in. grille can be converted to a vertical 18 x 24-in. unit. In addition, the grilles are considerably lighter in weight than either steel or aluminum models.
Airguide Plastics Corporation, 20 S. E. 3rd Ave., Miami 32, Fla.

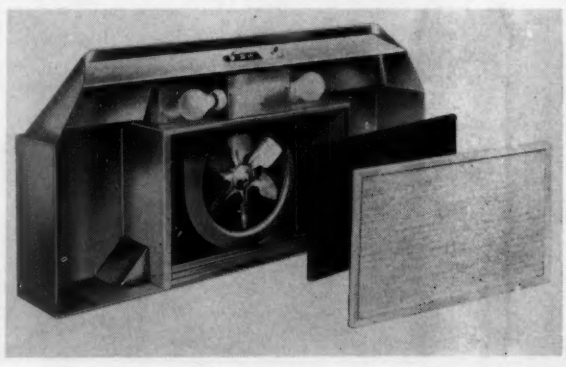
UNVENTED WALL HEATER

Permanently air-insulated, this recessed, unvented gas wall heater has an input of 5000 Btu/hr and is available in a choice of manual, free standing and automatic safety pilot controls. Natural, mixed or liquefied petroleum gas may be used. Unit is chrome-plated and requires only a simple opening between wall studs for installation.
Hanson Manufacturing Company, Inc., 221 Yorktown, Dallas 8, Texas.

DUCT-FREE RANGE HOOD

Available in four sizes – 24, 30, 36 and 42 in. wide – this duct-free hood is equipped with a two-speed fan to draw cooking vapors through two filters. Grease in the air is trapped by the first filter, constructed of aluminum mesh, and the second, activated charcoal, filters out odors. Cleaned air then is recirculated.

Control panel of the unit is centered up front, and the hood comes completely pre-wired. The alu-



minum filter is washable; the charcoal one requires occasional replacement.
Leigh Building Products Div, Air Control Products, Inc., Coopersville, Mich.

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Comment

ASHRAE JOURNAL

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WHAT CAN JOHNNY DO, WELL?

We take it that recognizably poor leather is seldom used to make a top-grade pair of shoes. We think it improbable that just any old kind of wheat can be processed to make premium flour. We think that few work horses have ever won the Kentucky Derby.

Correspondingly, we think that any outcome is to some major degree dependent upon the basic character and suitability for the purpose of the raw materials entering into its development. The educational product would seem to be no exception to this. So we wonder how some of our educators can be so concerned with the final result and apparently so little dismayed by the raw material with which they must work.

Unless there is a definite and strong urge on the part of students at the grade school level ultimately to undertake engineering and scientific activities, and unless such undirected minds are encouraged in their formative years to proceed toward such work, both the quantity and the quality of the candidates may fall far short of what the higher institutions require.

Were we an educator, we would be vastly concerned with making engineers and scientists out of those who falter before simple mathematical operations or with gaining intelligent thought and productive actions by those who have never subjected themselves to the mental discipline of learning to spell.

All of which is just another way of saying that we feel the crisis in education to be at the lower, even lowest levels, of original instruction. This is one of those problems about which you cannot say "Don't look now, it'll go away".

SADLY WE LISTENED

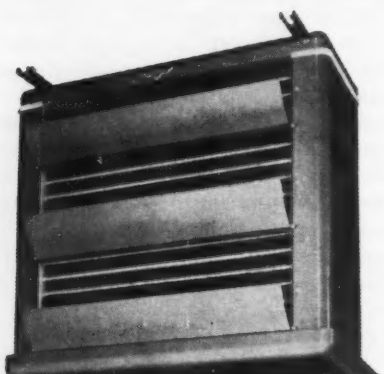
Just the other day we stood across the counter from a well-spoken, poised and apparently quite educated high school graduate who fumbled and refumbled for a card which would show her how much we owed for 12 days board of our dog at the vets at $1.50 a day.

As she did not accept our mental $18.00 as a total, we asked why she did not figure it herself. We still stand appalled by the shock of her reply "They taught us to add but I never was made to learn how to multiply." And she was not joking.

NOT SO HASTY PLEASE

For several years we kept three letters in our desk from as many college professors (actually department heads) who had individually succeeded therein in spelling incorrectly such common words as privilege, category and procedure, apparently with the utmost ease.

Edward R Searles
Editor



Larkin Humi-Temps Keep Vegetables At Peak of Freshness

Proper balance of temperature and humidity conditions, so essential to the protection of fresh fruits and vegetables, is easy with LARKIN Humi-Temps. Ample capacity has been engineered into the units to provide adequate chilled air throughout an enclosure without excessive humidity drop. Thousands of successful installations throughout the world prove LARKIN Humi-Temps a leader in the field of industrial and commercial refrigeration.

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ATLANTA 1, GEORGIA

What you may expect on this and future *National Meetings* programs

IT'S YOUR PROGRAM

As you read this article, you'll find yourself facing a decision. The Program Committee is asking you to decide whether you will become a part of the National Meetings Program activities or be just an observer. The committee is looking for critics it can convert to participants. So this article describes how you can get into the act.

ASHRAE is a professional engineering society, formed to promote the arts and sciences of heating, refrigeration and air-conditioning. Sharing available information on technical "know how," and encouraging the resultant incentive for further work becomes a basis for our success as a society.

We share our technical knowledge in many ways, at local meetings, in private talks and through articles in the JOURNAL, but the National Meetings offer the greatest opportunities for you to contribute to our Society's success. It is there that the best talent in our industries gather to discuss, criticize and perhaps praise the scientific advances of fellow scientists, engineers and technicians.

If our Society is to accomplish its goal in this manner, it must provide the opportunity, the incentive, and the right climate for its members to participate to their fullest capacity. Your officers and the appointed Program Committee have a plan to make this program successful. You'll have to tell us by your suggestions and actions actions whether you approve.

Do YOU Want to Participate in Your Society's Activities?

Before you answer, ask yourself these questions:

1. Are there other members with interests similar to mine?
2. Would I appreciate an opportunity to meet with them twice a year and discuss common problems and objectives?
3. Do I have something to contribute in a technical session that will be rewarding and possibly stimulate work by other interested persons to further my own knowledge in this field?

If you can answer yes to any of these equestions, you will want to be a part of our NEW PROGRAM. This really takes its cue from a well-known salesman who said, "Sell the customers what they **will** buy, not what you think they **should** buy." In this case, we are our own customers and we can buy whatever we want. It's our Society and there is almost no limit to our ability to serve ourselves what we want. We have a tested foundation to build upon.

So let's review it and do some more building. Each recent Annual and Semiannual Meeting has presented three types of organized open technical sessions:

RICHARD A. LINE
Chairman
ASHRAE Program Committee

- **Forums** – Where members and guests sit around a table and informally discuss a predetermined subject. A moderator guides the discussion, but no formal or prepared talks are presented. These sessions are designed for group participation in solving problems and updating technical information. They are "off-the-record" sessions.
- **Symposiums** – Where prepared papers, on a given subject, are presented and discussed. These are usually papers resulting from operation experience, not research, and are all related to a specific subject of immediate general interest to a specific group of engineers.
- **Technical Sessions**—Where carefully prepared and selected Technical Papers, usually a result of research, are presented for discussion.

Forums – Let's take a good look at Forums first. Anyone can suggest a subject, a moderator, and who might be interested in the subject. This information will be given to the member of the Program Committee responsible for Forums. Royal Buchanan, Assistant Director of Appliance Engineering and Research, American Motors Corporation, has this assignment now.

In the past, we have restricted the number of Forums to a maximum of six per meeting. This was done largely because of difficulty in finding sufficient interest areas.

Since everyone should participate, Forums should be made up of small groups (10 to 25 persons)

to be effective. So, three or four Forum subjects could logically be considered for each day's activities. Currently, John Everetts, Jr., C. S. Leopold, Inc., ASHRAE Second Vice President, who understands this procedure very well, wrote the Program Committee just before the deadline for getting program information to the printer asking for a room and a place on the program for a Forum on Psychometric Charts. He expressed willingness to organize and moderate the Forum. He had already contacted a number of people and expected 25 or more in attendance.

Jack has a strong interest in the subject and he knows others that do too. He sees a problem and a possible solution. He has found others who want to discuss it. He has the basis for a Forum.

If you have a vital interest in a subject and know others who you believe could help solve current problems, or help advance the art by intimate discussions at an Annual or Semiannual Meeting, write headquarters, the Program Chairman, or Royal Buchanan giving the subject and suggesting a moderator. The final plans for a National Meeting must be set about four months prior to the meeting in order to complete all printing and meeting facilities arrangements.

So Plan Now for Your next Forum.

Symposiums — The second type of organized open session prevailed, as such, in precedent ASHAE and in ASRE as an Engineering Conference. In the latter, this started when the top Engineering Management personnel of the domestic refrigerator manufacturers met and decided to organize and select a chairman to be held responsible for selecting a subject to be "aired" at the next annual meeting. This was well over a dozen years ago and the specific group has never missed having a well-planned, well-attended session at each meeting since then.

The present Domestic Refrigerator Engineering Symposium Chairman, E. J. Von Arb, Vice President in Charge of Engineering, Revco, Inc., explains their approach this way: He talks with top engineers in the domestic refrigerator field, and they arrive at a subject of current interest. It is then his responsibility to develop the program. In Chicago, in February, their subject is "Progress of Thin Wall in Cabinet Construction, Insulation," with speakers from:

Name	*Subject*
C. W. Newhall, Martin Sweets Co.	Practical Application of Foamed Insulation in Industry
Fred Hermanns, Admiral Equipment Co.	Bagged Insulation
William J. Neary Jennings Machine Co.	Theoretical Aspects of Foam Insulation
Robert Bilek, Hotpoint	Design Requirements for Thin Wall Refrigerator and Freezer Construction Using Various Insulations and Structural Materials
Phil Sanquinnetti, Mobay Chemical Co.	
Severn Joyce, Owens Corning Fiberglas	
Marion Hollingsworth	
E. B. Frankenhoff	

These domestic refrigerator engineers select a new chairman each year and he has always, in recent years, been appointed as a member of the Program Committee.

The Window Air Conditioner Manufacturer Engineers copied the Domestic Refrigerator Enginneers' program to a certain degree and also organized to hold Conferences, now called Symposiums, at each National Meeting. Currently, William Moll, Sales Manager, Air Conditioning & Dehumidifier Sales-to-Sears, Whirlpool Corporation, proved so competent at organizing the program that he has inherited a continuing assignment. Their program at Chicago is: "Air Movement, Humidity, and Humidity Control," with the following speakers:

Name	*Subject*
Professor M. K. Fahnestock, Mech. Eng. Dept. University of Illinois	Comfort and Physiological Adjustment of People to Environment.
Dr. R. G. Nevins, Mech. Eng. Dept., Kansas State University	Air Motion and Movement
Richard Signorelli, Assistant to the Vice President of Manufacture, Mueller Climatrol	Humidity and its Control in Residential Air-conditioning Systems.
Fred Appel, Projects Manager, Air-condition-Div., Whirlpool Corp.	Control of Humidity on Window-type Air Conditioners.

Bill explains his method of organizing the Symposium as follows:

"Last year, when I conducted the Symposium in Dallas, I started many months before and questioned my associates in the industry for subject material. I believe I called and wrote to fifteen chief engineers or directors. All were very cooperative and sent suggestions for my study. It was extremely interesting to lay out their replies and examine them because, throughout, there was a hint of a question in each. I interpreted this question to mean, 'What should I, as a Chief Engineer, be doing for my company besides designing mechanically an Air Conditioner?' I took this subject and called it 'Engineering Responsibility' and held the Dallas Meeting which was non-technical and, I believe, interesting.

"This year, I made a similar survey and many people wanted

Japanese Team Visits U. S. A.

Under the auspices of the International Cooperative Administration (U. S. A.), a Japanese Heating and Plumbing Team, headed by Kigoshi Takenaka has been making a visit of American projects of a related nature.

The tour, which started November 15 in San Francisco and concluded December 20 in Washington, D. C. brought the visitors to ASHRAE Headquarters where they met with members of the staff, explored our Library and undertook an all-day conference.

The team consisted of 18 members of whom Professor Hildeo Uchida of Tokyo University was one. Professor Uchida will remain in this country for the ASHRAE Semiannual Meeting in Chicago where he will present "Graphical Analysis of Cross Flow Cooling Tower" at the Third Technical Session.

Basic objective of the team is to improve production, manufacturing, designing and ultimate installation of heating and plumbing equipment.

a technical discussion of 'Air, Humidity, and Humidity Control,' so I tried to get the best speakers for the subject."

These Symposiums have been so interesting and successful that the Program Committee began a campaign to get other groups to organize in a similar manner. These committee members were selected carefully to represent as many segments of the total ASHRAE membership as possible:

Name, Special Interest

R. A. Line, Chairman
Manager, Marketing Services
Hussmann Refrigerator Co.
Commercial Refrigerator Manufacturers

Lincoln Bouillon—Vice Chairman
Bouillon, Griffith, Christofferson & Schairer
Professional Engineers & Architects

J. B. Graham
Director of Research
Buffalo Forge Co.
Ventilation and Air Handling

Prof. W. E. Fontaine
School of Mechanical Engineering
Director for Engineering Research
Ray W. Herrick Laboratories
Purdue University
Research & Training

E. J. Von Arb
Vice President
in Charge of Engineering
Revco, Inc.
Domestic Refrigeration

W. R. Moll
Sales Manager, Air Cond.
& Dehumidifier Sales-to-Sears,
Whirlpool Corp.
Window Air Conditioners

R. G. Raney
Marketing Manager, Ranco, Inc.
Controls

E. N. Johnson
Engineer
Swift & Co
Food Refrigeration

C. W. Pollock
Manager, Air Conditioning
& Refrigeration
Div of Crane Co
Unitary Air Conditioning & Heating

G. F. Carlson
Chief Engineer, Specialty Div
Bell & Gossett Co
Commercial & Industrial Heating

D. Lorne Lindsay
Wiggs, Walford, Frost & Lindsay
Consulting Engineers
Professional Engineers & Architects — Consultants

R. S. Buchanan
Asst. Director of Appliance
Engineering & Research
American Motors Corp
General Interests — Forums

J. A. McLean—ex officio
Westinghouse Electric Corp
General Interests — Research Exhibits

Now, if your interest group isn't represented, we suggest you discuss the subject with your counterparts and select a representative, recommend him to ASHRAE President Walter Grant for Program Committee membership, and thus perhaps get your man to work organizing a program for a Symposium.

This plan works. For example: Ed Johnson started working with E. J. Robertson, Research and Technical Div, Wilson & Co., and others last July, and we shall have a Frozen Food Handling Symposium in Chicago, in February, with the following speakers and subjects:

Name	*Subjects*
C. F. Evers, Manager of Commercial Development International Minerals & Chemical Co	Handling Practices Recommended by Early Authorities
D. A. Guadagni, Head Food Appraisal Investigations Western Regional Research Laboratory	Effects of Time and Temperature on Frozen Food Quality
Lowell Oranger Department of Agriculture, Div of Foods, Dairies and Standards, State of Illinois	Handling Frozen Foods at the State Level
Edward Sherby, Publisher Frosted Food Field	Industry Position
Miss Dolores Palmer Smith Bucklin & Associates, Ind.	What the Consumer Wants in Frozen Foods

Gil Carlson organized a "Medium Temperature Water for Heating" Symposium for Chicago with the following speakers:

Name	*Subjects*
Chairman: Lincoln Bouillon, Bouillon, Griffith, Christofferson & Schairer	Basic Types of Hot Water Systems. Basic Reasons for Medium Temperature Water. Pumping Methods
Homer Bird Bird, Bird and Associates	Heat Transfer Selection and the Effect of Increased Design
Sam Miller, Chief Engineer J. J. Nesbitt, Inc.	Temperature Drop on Heat Transfer Controlability as Effected by Valves
G. F. Carlson Chief Engineer, Specialty Div Bell & Gossett Co	Pump Curve and Pressure Drop Curve as Affected by Increased System Temperature
Ray Harmon Harmon & Beckett	Specific Equipment Selection for the Medium Temperature Water System, plus a discussion of adequate Pressureization

Barrie Graham organized a Ventilation Symposium entitled "Performance Determination in Installed Systems" with the following speakers and subjects:

Name, Subject:

James Bricker
Charles S. Leopold, Inc
Field Check of Ventilation and Air Conditoning Systems

K. E. Robinson
General Motors Corp
Industrial Ventilation Systems

R. J. Walker
Dow Chemical Co
Ventilation Systems with Special Requirements

These will be top level technical sessions on the status of the "Art" and are designed to create further interest, communications, and development in each of these fields. Each group will no doubt demand and get space and time on each succeeding National Program.

Your Program Chairman promoted one additional Symposium for Chicago: on ASHRAE Sponsored Research.

(Continued on page 102)

Chicago to Welcome

ASHRAE Semiannual Meeting

To be held in Chicago, February 13-16, the 1961 Semiannual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers will link closely with the 15th International Heating and Air Conditioning Exposition. Headquarters will be at the Conrad Hilton Hotel. The Exposition will be at the International Amphitheatre.

At this meeting, new officers will be installed at the Banquet on Tuesday evening, February 14, rather than at the Welcome Luncheon. Under the ASHRAE Agreement for Consolidation, R. H. Tull will succeed Walter A. Grant as President; John Everetts, Jr., will become First Vice President and, as official nominee, it is likely that John H. Fox will become Second Vice President. Again, as official nominee, John E. Dube will probably succeed himself as Treasurer.

There will be four technical sessions during which 16 formally prepared papers will be presented upon various topics in groups under the headings of Combustion, Insulation, Refrigeration and General. Symposiums will total six, as will Forums. Topics for the first of these less formal occasions have been embodied under the headings of Frozen Food Handling, Medium Temperature Water Heating, Air Conditioning, ASHRAE Research Plans and Programs, Domestic Refrigeration and Ventilation. Forums, as usual completely off-the-record gatherings, will review Transport Refrigeration, the proposed new Psychrometric Chart, Better Environments for Learning, Corrosion of Air Conditioning Components, Aluminum Brazing and Welding Techniques and the status of Thermoelectric Refrigeration.

Social events, still in the process of definition and amplification, include the Welcome Luncheon on Monday, the Banquet on Tuesday, and side trips to such points as the Commonwealth Edison Dresden nuclear power station, and special events of interest to the ladies.

Reservations for exhibit space at the 15th International Heating and Air Conditioning Exposition have reached a new high and the Exhibit should provide an unusual focus for interest and attention upon the activities of manufacturers and their equipment offerings. Special arrangements by the Exhibit Committee provide frequent bus transportation between the Conrad Hilton and other downtown Chicago hotels and the International Amphitheatre. The Exhibit parallels those four days during which the Semiannual Meeting will be held.

February will be the Show Issue of your ASHRAE JOURNAL and will provide a floor plan, a list of exhibitors and other features.

Here's an outline of the complete program, subject to last minute changes and to rearrangement and possible reassignment.

First Technical Session

Corrosion Inhibition in Steel Tubes in Low Pressure Steam Boilers—W. A. Keilbaugh, Head, and F. J. Pocock, Senior Chemist, Chemical Section, Research Center, Babcock & Wilcox, Co.

Evaluation of Wet Cell Air Humidifiers—Dr. Melvin W. First, Consulting Engineer.

Metastability of Liquids in Heat Exchangers—B. H. Jennings, Professor of Mechanical Engineering, Northwestern University.

Flow and Heat Exchange Characteristics of Finned Tube Exchangers—Benjamin Gebhart, Associate Professor of Mechanical Engineering, Cornell University.

Second Technical Session

Field Laboratory for Heating Tests—D. B. Anderson, Technical Assistant to Vice President, Sales, G. A. Erickson, Director of Technical Sales Service, and R. R. Leonard, Research Engineer, Wood Conversion Co., and Dr. R. C. Jordan, Head, Department of Mechanical Engineering, University of Minnesota.

Thermal Conductivity of Porous Materials—Dean Melvin Mark, Lowell Technical Institute, and Mark E. Stephenson, Jr., Consulting Engineer.

Heat Transfer through Mineral Wool Insulation in Combination with Reflective Surfaces—C. E. Lund, Professor, and R. M. Lander, Research Associate, Department of Mechanical Engineering, University of Minnesota.

ngand Exposition

February 13-16

Thermal Effects of Floor Construction—R. D. Cramer, Assistant Professor of Housing, Department of Home Economics, and L. W. Neubauer, Associate Professor, Department of Agricultural Engineering, University of California.

Third Technical Session

Evaluation of Wet Bulb Data for Cooling Equipment Design—L. W. Crow, Consulting Meteorologist.

Reaction of Dichlorodifluoromethane with Petroleum Oils—Dr. H. O. Spauschus, Research Associate, and G. C. Doderer, Chemist, Major Appliance Division, General Electric Co.

Sizing of Refrigeration System Pipelines for Optimum Economy—D. J. Renwick, Associate Professor of Mechanical Engineering, Michigan State University.

Graphical Analysis of Cross Flow Cooling Tower—Professor Hideo Uchida, Department of Mechanical Engineering, University of Tokyo.

Fourth Technical Session

Combustion-Driven Pulsations in Oil-Fired Residential Heating Equipment—A. A. Putnam, Staff Mechanical Engineer, and C. F. Speich, Principal Mechanical Engineer, Battelle Memorial Institute.

Noise Suppression in Oil Burners—R. W. Sage, Section Head, and H. F. Schroeder, Research Engineer, Products Design Division, Esso Research and Engineering Co.

Suppression of Pulsations in Oil-Fired Residential Heating Equipment—C. F. Speich, Principal Mechanical Engineer, and A. A. Putnam, Staff Mechanical Engineer, Battelle Memorial Institute.

Influence of the House on Chimney Draft—A. G. Wilson, Head Building Services, Division of Building Research, National Research Council of Canada.

Frozen Food Handling Symposium

Chairman—E. J. Robertson, Research and Technical Director, Wilson & Co., Inc.

Early Scientific Background—Clif Evers, Manager, Commercial Development, International Minerals & Chemical Co.

Effects of Time and Temperature on Frozen Food Quality—Dr. D. G. Guadagni, Food Appraisal Investigations, Western Regional Research Laboratory (DA).

Handling Frozen Foods at the State Level—Lowell D. Oranger, Superintendent, Div. of Foods, Dairies and Standards, Ill. Dept. of Agriculture.

Recommendations of the Frozen Foods All-Industry Coordinating Committee—Edward Sherby, Publisher, "Frosted Food Field".

Consumer Needs and Preferences for Frozen Foods—Miss Dolores Palmer, Frozen Potato Products Institute

Medium Temperature Water Heating Symposium

Chairman—Lincoln Bouillon, Bouillon Griffith, Christofferson & Schairer.

Pipe and Pump Size Reduction with MTW Systems—Homer Bird, Bird, Bird and Associates.

Heat Transfer—Effect of Increased Temperature Drop on Valve Control—S. W. Miller, Chief Engineer, J. J. Nesbitt, Inc.

Effect of System Temperature on Pump Curve and Pressure Drop Curve—G. F. Carlson, Chief Engineer, Specialty Division, Bell & Gossett, Co.

Pressurization of MTW Systems—Raymond Harmon, Consulting Engineer, Harmon & Beckett.

Air Conditioning Symposium: Air Movement, Humidity, and Humidity Control.

Chairman—W. R. Moll, Sales Manager, Air Conditioning & Dehumidifier Sales-to-Sears, Whirlpool Corp.

Comfort and Physiological Adjustment of People to Environment—Professor M. K. Fahnestock, Department of Mechanical Engineering, University of Illinois.

Air Motion and Movement—Dr. R. G. Nevins, Department of Mechanical Engineering, Kansas State University.

Humidity and its Control in Residential Air-Conditioning Systems—Richard Signorelli, Assistant to Vice President of Manufacture, Mueller Climatrol.

Control of Humidity on Window-type Air Conditioners—F. T. Appel, Projects Manager, Air-Condition Division, Whirlpool Corp.

ASHRAE Research and Technical Plans Symposium

Chairman—E. P. Palmatier

ASHRAE Research Laboratory Program
Environment—B. H. Jennings, Director
Odors—W. F. Kerka, Research Engineer
Sound—W. F. Kerka, Research Engineer
Solar Radiation on Fenestration—L. F. Schutrum, Research Supervisor
Entrance Infiltration—L. F. Schutrum, Research Supervisor
Human and Animal Calorimeter—R. G. Huebscher, Research Supervisor
Control—R. G. Huebscher, Research Supervisor
Flow of Steam in Pipes—C. M. Humphreys, Assistant Director

ASHRAE CHAPTERS ENTER THEIR BUSY SEASON PAGE 80

How a New Product Comes into Being—W. F. Wischmeyer, Sporlan Valve Co.

Cooperative Research Programs
Review—E. P. Palmatier
Benefits—Dr. R. G. Nevins—Department of Mechanical Engineering, Kansas State College

Benefits of ASHRAE Research to Industry and the Engineering Profession
G. R. Munger, Owens Corning Fiberglas.
R. M. Stern, Consulting Engineer, Stern and Towne.
F. H. Faust, General Electric Co.

Filling out the ASHRAE Laboratory Picture—E. P. Palmatier. Physical Plant; Personnel; Finances; Administration, including function of R & T Committee

Domestic Refrigeration Engineering Symposium

Chairman—E. J. Von Arb, Vice President in Charge of Engineering, Revco, Inc.

Practical Application of Foamed Insulation in Industry—F. Newhall, Martin Sweet Co., A. H. Herrmann, Admiral Equipment Co., and William J. Neary, Jennings Machine Co.

Bagged Insulation—Robert Bilek, Hotpoint Co.

Theoretical Aspects of Foam Insulation—P. A. Sanquinetti, Mobay Electric Co.

Design Requirements for Thin Wall Refrigerator and Freezer Construction Using Various Insulations and Structural Materials—Severn Joyce, Marion Hollingsworth, E. B. Frakinhopp, Owens-Corning Fiberglas Co.

Ventilation Symposium: Performance Determination in Installed Systems

Chairman—J. B. Graham, Director of Research, Buffalo Forge Co.

Field Check of Ventilation and Air Conditioning Systems—James Bricker, C. S. Leopold, Inc.

Industrial Ventilation Systems—K. E. Robinson, Personal Hygiene Department, General Motors Corp.

Ventilation Systems with Special Requirements—R. J. Walker, Plant and Process Engineering Group Leader, Dow Chemical Co.

ABSTRACTS OF TECHNICAL SESSION AND SYMPOSIU PAPE

FIRST TECHNICAL SESSION—MONDAY, FEBRUARY 13, 9:30 A.M.

Corrosion inhibition on steel tubes in low-pressure steam boilers

W. A. KEILBAUGH
Head, Chemical Section
Babcock & Wilcox Co., Research Center

F. J. POCOCK
Senior Chemist
Babcock & Wilcox Co., Research Center

Results of the authors' investigations of steel tube corrosion in low-pressure (15 psig max) steam boilers are given in this paper, the second of two, reporting work done for the Steel Boiler Institute. Many factors influencing tube corrosion were studied under both dynamic conditions in small test boilers and under simulated storage conditions. Several chemical corrosion inhibitors were found satisfactory. Recommendations, based on the findings of this research program which spanned five years, are made for the waterside care of steel tubing in low-pressure steam boilers.

This paper appeared in full in the October issue of the JOURNAL.

Design of wet cell air humidifiers

MELVIN W. FIRST
Consulting and Research Engineer

A variety of commercial and experimental wet cell packings was investigated to determine humidification efficiency and air flow resistance in relation to air flow rate, spray water rate, spray nozzle design,

Forums

Chairman—R. S. Buchanan, Assistant Director of Appliance Engineering and Research, American Motors Corp.

1. Transport Refrigeration—Moderator, P. R. Achenbach, Chief, Mechanical Systems Section, National Bureau of Standards.
2. A New Psychometric Chart—Moderator, John Everetts, Jr., ASHRAE 2nd Vice-President, C. S. Leopold, Inc.
3. Better Environments for Learning—Moderator, J. D. Kroeker, Consulting Engineer, J. D. Kroeker and Associates.
4. Corrosion of Air Conditioner Components—Moderator, C. O. Hutchinson, Manager, Market Development, Industrial Paint Division, The Glidden Co.
5. Aluminum Brazing and Welding Techniques—Moderator, A. J. Haygood, Alcoa.
6. Status of Thermoelectric Refrigeration—Moderator, G. D. Hudelson, Development Department, Carrier Research & Development Co.

PAPERS TO BE PRESENTED AT THE ASHRAE SEMIANNUAL MEETING

and cell packing characteristics. Filament size and shape, cell porosity, and cell thickness were found to be important performance factors.

Humidification efficiency was directly related to the ratio of water to air, and the ratio of spray droplet surface area to total volume of water sprayed. For constant ratios of water-to-air, the effect of air flow rate on humidification efficiency was negligible over the range of air flows studied.

Liquid carry-over from wet cells is an important consideration in the practical application of humidification equipment. It was found that spray devices which form fine droplets could be used successfully with fine diam fiber packings but coarse-spray nozzles were essential with large, porous packings.

Increases in the air flow rates generally employed in washers appear to be practical, provided corresponding increases in water rate are made. This modification may not be possible with many existing installations because of the greater resistance associated with high air and water flow rates, but new systems may utilize smaller equipment sizes profitably.

The metastable state of water in relation to heat exchangers

BURGESS H. JENNINGS
Presidential Member
Fellow
ASHRAE

Professor Mech. Eng.
Northwestern University
Director of Research
ASHRAE Laboratory

At the request of the TAC on Hot Water and Steam, investigations were carried out in an effort to determine whether conditions associated with the metastable state might produce explosive actions in equipment of sufficient intensity to cause rupture of boiler walls or piping. Evidence obtained rather strongly indicated that serious damage from this cause is highly improbable, but under conceivable circumstances, not impossible.

Two things are evident from the tests. First, that in normal cooling, the metastable temperature was never many degrees away from that corresponding to pressure equilibrium; and, second, the magnitude of the shock is relatively small, probably in every case less than 5 psi.

The investigators concluded that metastability

does not create a danger or hazard in the operation of equipment. However, it must be stated that pressure pulses can be caused by metastability; and it is possible to imagine a set of circumstances under which such pressure pulses could be severe enough to cause damage.

This paper appeared in full in the December issue of the JOURNAL.

Flow and heat exchange characteristics of finned tube exchangers

B. GEBHART
Associate Professor of Mech. Eng.
Cornell University

This paper summarizes a study carried out at Cornell University with the support of the Salvatore Giordano Foundation. An attempt was made to improve the design of finned tube exchangers of the continuous (or plate fin) type.

Since the heat transfer and flow loss characteristics of a fin are largely determined by the detailed nature of the flow process over the fins and associated tubes, models were built and studied in a visualization tunnel. Smoke filaments were introduced on the surfaces and in the vicinity of various models; detailed flow processes were observed.

Consideration of heat transfer and flow loss characteristics of numerous types of surfaces, involving differing amounts of flow separation, led to the definition of a performance parameter called the "effectiveness ratio." This parameter is the ratio of heat transfer and flow loss effectivenesses and is a sensitive indicator of performance.

A relieved fin was designed which provided boundary layer relief and avoided flow separation. Tests were conducted in which this coil was compared with a flat fin coil of similar construction. This relieved fin was inferior to the flat fin for low turbulence streams and somewhat superior to it for high turbulence streams.

Five other relieved fins were then designed and tested at two different turbulence levels. Four of the designs had a higher effectiveness ratio than the flat fin. Two of the designs had both higher heat transfer and lower flow loss than the flat fin. Two others had somewhat lower heat transfer and lower flow loss. The fifth design was inferior. The improvement of the best design, over the flat fin, was 15 to 20 per cent.

These studies demonstrate that a rational approach, based upon flow considerations, can lead to much improved fin design. The improvement quoted above is not expected to be the limit, but it is the best achieved in two attempts to obtain both higher heat transfer and lower flow loss.

SECOND TECHNICAL SESSION—MONDAY, FEBRUARY 13, 9:30 A.M.

Field Laboratory for heating studies

D. B. ANDERSON
Member ASHRAE
Technical Assistant to Vice President, Sales

G. A. ERICKSON
Member ASHRAE
Technical Director Sales Service

R. R. LEONARD
Research Engineer
Wood Conversion Co.

R. C. JORDAN
Presidential Member ASHRAE
Professor and Head Dept. of Mech. Eng.
University of Minnesota

Current energy demands of the United States for power, processing, and heat average approximately 100,000 billion Btu per day, 30 per cent of which is required for space heating. The proportion is likely to remain constant for the next century, while at the same time, the total energy requirements of the United States and of the rest of the world are increasing both with the booming population growth and the impact of rapid technological changes on our standard of living.

Expanded demand has resulted in increases in the cost of oil and gas during the last three decades; yet an increase in the efficiency of conversion has reduced the cost of electricity. All of these fuels are now economically feasible for space heating under some conditions. Nevertheless, the cost of all forms

of space heating have risen, and the consuming public has become more aware of the need for conserving space heating energy through the adaptation of properly engineered heating systems coupled with thermally efficient structures.

Many gaps remain in our knowledge of the design and functioning of heating systems when applied to structures. The individual thermal conductivities of the materials used in wall sections are known, but the effects of framing members and other field installation variables are not duplicated in laboratory tests. Infiltration assumptions are only approximate at best.

Thus, it appears probable that the heating demands of a structure are, to an appreciable extent, dictated by the ventilation needs and that in tight structures, either artificial ventilation or some internal means of moisture and odor removal may be required. The structure to be heated is affected by the mass of earth of high heat capacity and high thermal conductivity on which it rests. When it is subjected to a high intensity solar radiation field, a portion of this energy being absorbed in the outside surface and a portion transmitted through the fenestration to the interior, the varying wind conditions, temperature, rainfall outside, and heat and moisture gains inside must also be considered. In designing a structure to provide comfortable living conditions for people who live, work, play inside, we are not always certain of the effects of these living habits upon the heating demands of the structure.

To try to fill some of these gaps in our knowledge, two test houses were constructed to provide field laboratories. An attempt was made to provide a complete picture of the interplay of the various heating demands and heating losses to which a structure is subjected when placed in the transient environment in which it actually exists.

This first article describes the details of the structures, the instrumentation, the operating condition for the first winter's tests and the test objectives. Future articles will discuss the results obtained.

Thermal conductivity of porous materials

MELVIN MARK
Dean of Faculty
Lowell Technological Institute

MARK E. STEPHENSON, JR.
Consulting Engineer

A knowledge of the fundamental relationships which relate the thermal conductivity of cellular materials to their cell size and shape, apparent density, and material-property values is of interest, since the application of these substances as insulation is quite common. Various mechanisms of heat transfer through such materials are considered and evaluated.

Thermal conductivity is not a unique function of apparent density, cell size being in many cases a more important parameter. In the case of a material made up of large numbers of cells, a simplified model is considered and a relationship derived between the geometrical parameters which determine the apparent density and gas-cell size, and the heat-transfer parameters which influence the gas conduction, solid conduction, radiation, and convection.

Certain general conclusions are checked qualitatively with existing experimental data on plastics foams. For the case of a cellular material of constant wall thickness, a minimum value of thermal conductivity at an "optimum" value of apparent density is predicted; this is compared with existing experimental data on fibrous materials of constant strand diam. For honeycomb materials approximate methods of estimating the thermal conductivity are discussed, and the effect of apparent density and gas cell size are studied in relation to experimental data on honeycombs of various dimensions and materials.

Heat transfer through mineral wool insulation in combination with reflective surfaces

C. E. LUND
Member ASHRAE

Professor Mechanical Engineering
University of Minnesota

R. M. LANDER
Research Fellow
Department of Mechanical Engineering
University of Minnesota

Present methods of calculating the heat transmission through insulated structures assume that the temperature gradient through framing members is linear and independent of the adjacent air spaces and insulating materials. These methods also assume that the heat transferred within the stud or joist spaces

WALTER A. GRANT
President

R. H. TULL
First Vice President
and President-Elect

At the ASHRAE Semiannual Meeting in Chicago

is between two infinite parallel surfaces, with the heat transfer to the joists disregarded. When the direction of heat transfer is downward through a joist space, it has been previously assumed that the temperature varied linearly along the enclosed joist surfaces, and that natural convection of air is negligible. The heat transfer is then primarily by radiation and conduction.

This paper summarizes the results of studies conducted over a period exceeding three years to determine: (1) the accuracy of present conventional methods of calculating the different directions of heat flow through insulated frame structures; (2) the effectiveness of reflective materials in combination with mineral wool insulation under different modes of heat transfer.

Results show that the present ASHRAE Guide method of calculating the thermal transmittance coefficients for walls and ceilings in combination with mineral wool insulation and air spaces under winter conditions agrees closely with the test values. This applies to both non-reflective and reflective surfaces.

For heat flow under summer conditions, a greater difference occurs for the reflective surfaces. Differences between the calculated and the test value decreases as the insulation thickness increases.

Effectiveness of reflective surfaces upon ceiling insulation within attics decreases rapidly due to surface contamination under field exposure. Additional studies of surface contamination on reflective surfaces exposed to field conditions should be undertaken for both wall and ceiling structures.

Present methods of calculations make it difficult to calculate with satisfactory accuracy the transmittance coefficients for the special types of multiple layers of foil insulation. Guarded Hot Box tests should be required to evaluate these materials installed in place as recommended by the manufacturer.

Thermal effects of floor construction

RICHARD D. CRAMER
Associate Professor of Housing
Department of Home Economics
University of California, Davis

LOREN W. NEUBAUER
Associate Professor
Department of Agricultural Engineering
University of California, Davis

A comparison is made of the thermal performance of two experimental structures which are identical except for floor construction. One has a conventional wood floor the other a four in. concrete slab on grade. Walls and roof in both structures are wood construction insulated with two in. of mineral wool, except for one wall of unshaded glass which faced south for these tests.

Tests were repeated at the summer and winter solstices and spring and fall equinoxes. They con-

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sisted of exposure to the weather in an unsheltered location for several selected clear dry days – weather which is typical in much of the southwest. Diurnal temperatures were measured by thermocouples and recorded automatically at subfloor, floor, room air locations in the structures, in the outside air, and in the soil four in. below the surface.

An analysis of the performance of each structure at each season of the year is given, leading to comparisons of performance from season to season and comparison of the influences of floor construction in any one season.

For residential purposes, under the conditions of the experiment, concrete slabs seem to have some thermal advantages over conventional wood floor systems.

This paper appears in full in this issue of the JOURNAL.

THIRD TECHNICAL SESSION—TUESDAY, FEBRUARY 14, 9:30 A.M.

Evaluation of wet bulb data for cooling equipment design

LOREN W. CROW
Consulting Meteorologist
Member ASHRAE

Accurate design of any cooling equipment which involves the atmosphere as a heat carrying agent can only be accomplished when the engineer has thorough knowledge of the variable natural heat content of the air at any particular location.

Design engineers, who make decisions related to buying, building or selling evaporative cooling towers that operationally must deliver cooled fluid of not more than some specified maximum temperature, must concern themselves with the variable nature of the atmosphere. A decision in economics is required for each specific installation. If the cooling tower is larger than required, its cost will be unnecessarily high. If the cooling tower is too small, it will not accomplish its assigned task and heavy monetary losses may result.

Extensive tabulations have been made of hourly wet bulb temperatures during 10 summer seasons at 432 weather observing sites. The author presents excerpts from a new Fluor Products Company manual, "Evaluated Weather Data for Cooling Equipment Design," which summarizes the detailed tabulations and presents them in usable form for all engineers concerned with cooling equipment design.

PRESIDENT GRANT TAKES A LOOK AT OUR LONG-RANGE GOALS PAGE 55

Reaction of Refrigerant 12 with petroleum oils

H. O. SPAUSCHUS
Member ASHRAE
Research Associate
General Electric Co.

G. C. DODERER
Member ASHRAE
Physicist
General Electric Co.

Products formed when Refrigerant 12 and petroleum oils react at high temperatures have been studied with an analytical mass spectrometer. The effects of time, temperature, type of oil and Refrigerant 12-oil ratio have been investigated. Reaction mechanisms which account for the products and their rates of formation are proposed.

The first reaction product is Refrigerant 22, proving that Refrigerant 12 decomposition is not stoichiometric with respect to chloride formation. Quantitative determination of Refrigerant 22 provides a rapid and sensitive method for comparing the effects of type of oil, oil additives, catalysts, etc., on the reaction rate.

Sizing of refrigeration systems for optimum economy

D. J. RENWICK
Associate Professor
of Mechanical Engineering
Michigan State University

A review of the economics of pipe size selection for electric motorized compression refrigeration systems is thought to be opportune, since in recent years the cost of electricity per kw hr has been gradually decreasing, while at the same time piping costs have risen considerably. Hence, a series of pipe selection charts, which are based on the several economic factors that should be considered in determining the optimum size of refrigeration piping systems, have been developed and are presented. The charts are easy to use and allow for changing economic conditions, so that alternate design factors either known or estimated to be true can be rapidly compared by the refrigeration engineer. Fundamental analysis for constructing the charts is included, and additional factors of importance in pipe sizing, distinct from economy, are also discussed.

Graphical analysis of a cross-flow cooling tower

HIDEO UCHIDA
Member ASHRAE
Professor of Mechanical Engineering
University of Tokyo

Analyses of cross-flow cooling towers have been provided previously by several authors. Snyder's theoretical analysis, assuming a linear relationship between water temperature and the corresponding enthalpy of saturated air, resembles that of cross-flow heat exchangers, except that enthalpy potential is used for cooling towers, whereas temperature is used for heat exchangers.

It was Snyder's purpose to obtain experimental results. Zivi and Brand use the same differential equation presented in this paper giving the water temperature distribution in the fill of a cross-flow cooling tower. This procedure is suited for automatic computation under the trial and error method.

The author presents here his graphical analysis of a cross-flow cooling tower.

FOURTH TECHNICAL SESSION—THURSDAY, FEBRUARY 16, 9:30 A.M.

Combustion-driven pulsations in oil-fired residential heating equipment

This is the sixth of a series of papers prepared as part of a research program concerning the fundamental nature and causes of combustion-driven pulsations in oil- and gas-fired residential heating equipment. The

program was sponsored jointly by the predecessor American Society of Heating and Air-Conditioning Engineers, Inc., the Oil-Heat Institute of America, Inc., and the American Gas Association. A mechanism is proposed for explaining the generation of pulsations in oil-fired heating equipment.

According to this mechanism, a pulsating condition may be sustained by the proper phasing between an acoustic pressure oscillation which depends upon the furnace volume, and a periodic rate of heat release which depends upon the local air-fuel ratio and the quantity of recirculated hot combustion products in a proposed critical ignition region.

If the acoustic pressure oscillation can be damped out, the periodicity of the rate of heat release eliminated, or the phasing between the two phenomena changed, the pulsation can be suppressed.

C. F. SPEICH
Battelle Memorial Institute

A. A. PUTNAM
Battelle Memorial Institute

This paper appeared in full in the November issue of the JOURNAL.

Suppression of pulsation in oil-fired residential heating equipment

A. A. PUTNAM C. F. SPEICH

This is the last of a series of seven papers resulting from a fundamental research program concerned with the determination of the mechanism of pulsation and means of suppressing pulsations in oil-fired and gas-fired residential heating equipment. This paper discusses the more common means of reducing pulsations found in oil-fired equipment in light of the mechanism of pulsations proposed in a previous paper.

The mechanism suggests that pulsations result from the proper phasing of an acoustic pressure oscillation and a periodic rate of heat release. In this paper, such techniques as controlled combustion-chamber venting and acoustic filters are shown to affect the amplitude of the acoustic pressure within the combustion chamber.

Other techniques such as changes in fuel spray, air, and recirculation patterns, as well as the use of flame stabilizers are believed to affect the periodic ignition associated with pulsations in oil-fired equipment.

Noise suppression in oil burners

R. W. SAGE
Associate ASHRAE
Section Head
Products Research Div.
Esso Research and Engineering Co.

H. F. SCHROEDER
Products Research Div.
Esso Research and Engineering Co.

An experimental study of the mechanism causing domestic oil burner noise was carried out, in order to discover effective means of reducing noise levels and eliminating pulsations. Conventional oil burners and furnaces of both the high- and low-pressure types were used, and careful measurements of sound levels were made at a variety of operating conditions.

It was found that periodic flame extinction occurs when sound waves generated by the flame are reinforced by acoustical characteristics of the furnace. The result is the high energy, low frequency sound wave known as pulsation.

Controlled venting of the firebox, using a simple annular-shaped venting plate that will fit around the blast tube of a conventional burner, was found to be the most effective method of preventing pulsation, although other techniques partially successful in the laboratory, were found.

"Ordinary" noise from the burner was more difficult to reduce. As was expected, reducing the firing rate did lower the noise level proportionately, but the only other variable that had a significant effect was spray angle. In general, a narrow spray angle gave less noise than a wide angle, but the effect was relatively minor.

This paper appeared in full in the October issue of the JOURNAL.

SOME THINGS TO LOOK FOR ON FUTURE NATIONAL MEETINGS PROGRAMS PAGE 27

Influence of the house on chimney draft

A. G. WILSON
Head, Building Research
National Research Council, Canada

An analysis is made of draft failure in chimneys serving furnaces operating at low rates of combustion during mild weather, as can occur when the combustion rate is under hand control or is automatically modulated in accordance with heat requirements. It is shown that under these conditions the relation between chimney draft and house stack effect becomes important in determining when venting failure will occur.

A simple equation expressing this relation is developed, and a specific venting problem with hand-fired coal burning furnaces is used as an example. It is shown that such venting failure is unlikely with chimneys located within the house, in contrast to chimneys located at outside walls and exposed to the weather.

Measurements of chimney draft and house pressures in a single-story house with an oil-fired furnace are given, demonstrating that chimney draft, either with the burner on or off, is increased by lowering the house neutral zone and is decreased by raising it by an amount corresponding to the change in house pressure at the furnace. The effect of furnace operation on the level of the neutral zone is also shown.

Measurements on a furnace with a high pressure oil burner are given. They establish that substantial increases in pressure occur in the fire box during start-up and that positive pressures may exist for several seconds. Similar increases in pressure of lesser magnitude occur at the base of the chimney. The amount of positive pressure and the period over which draft failure occurs depends to some extent on the draft available prior to start-up. Draft recovery after burner start-up was quite rapid in the installation tested, even following long burner-off periods.

This paper appeared in full in the December issue of the JOURNAL.

FROZEN FOOD HANDLING SYMPOSIUM—MONDAY, FEBRUARY 13, 9:30 A.M.

Frozen Food Handling

E. J. ROBERTSON
Chairman
Research & Technical Div.
Wilson & Co.

This is the first of a series of meetings which are intended to be of an informative nature on the past, present and future of Frozen Food Handling.

Early Scientific Background

CLIFFORD EVERS
Manager
Commercial Develop.
International Minerals
& Chemical Co.

It has always been recognized that quality could only be maintained by proper freezing and the use of low temperatures in warehousing and distribution.

Effects of Time and Temperature on Frozen Food Quality

DR. D. G. GUADAGNI
Food Appraisal Investigations
Western Regional Research Laboratory

While temperature is of paramount importance in determining the rate of quality deterioration in frozen foods, the time of exposure at any given temperature is equally important in determining the total amount or degree of quality loss incurred. In the past, a great deal of emphasis has been placed on the effect of temperature and little attention has been devoted to the factor of time. Attention has been focused on high temperatures in frozen food handling but there has been much less concern with regard to time-temperature experiences in the freezing operation — particularly pallet freezing. This paper summarizes the effects of time and temperature on a number of frozen foods. It also evaluates the effects of various handling and freezing practices on the quality of certain frozen products.

Handling Frozen Foods at the State Level

LOWELL ORANGER
Superintendent, Div. of Foods,
Dairies & Standards
Illinois Dept. of Agriculture

The food industry of the United States, from producer to retailer, has provided the highest quality of food anywhere in the world. In the past few years the industry has selected a new method of handling foods — by freezing them.

The quality of frozen foods is the responsibility of the entire industry—producer, processor, transporter, warehouseman, distributor and retailer.

It is the duty of each state official who is responsible for the quality

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EXPOSITION—S. O. Erickson, Vice-Chairman, J. Lebow, F. Schwarz, E. L. Kadlec, Jr., S. Gospodarczyk, E. Gustafson, D. J. Ryan, R. Stewart, F. Joesting, J. M. Frank, J. Fujimoto, J. Garnett.

ENTERTAINMENT—H. E. Anderson, Chairman, B. E. Seaman, Vice-Chairman, J. S. Kearney.

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PUBLICITY—R. W. Roose, Vice-Chairman, R. J. Ladner, J. H. Gazlay, H. Scharres.

of frozen foods bought by the consumer to adopt a code of ethics which set forth the responsibility of each segment of the industry.

Extensive studies in the time-temperature field are now being conducted by government agencies and universities, and as soon as they are released the various states will adopt a uniform code. This will be an asset to the industry; however, additional scientific facts are needed before bacterial limits are established for frozen foods.

No industry has ever been 100% self-policing. It must rely on the state official to enforce its code in dealing with the unscrupulous operator who cheats by producing a product of low quality for the consumer.

The Industry Position

EDWARD SHERBY
Publisher
Frosted Food Field

From the time that the Association of Food and Drug Officials of the United States began work on its Model Code in 1958, the frozen food industry has been almost unanimously in accord with its major objective, namely, to upgrade the quality of frozen foods through improvement in handling practices. However, just as it is in agreement with the desirability of eliminating any existing malpractices in handling, dominant industry opinion is vigorously opposed to the 0 F maximum temperature as the only criterion that the Code lays down for proper frozen food handling.

The frozen food industry points out that, for one thing, the AFDOUS Code takes no cognizance of the time that product may have been exposed to above-zero temperatures. Yet extensive research has shown that time is as important a factor as temperature in quality deterioration. More important still, by AFDOUS' own admission, the public health record of the frozen food industry has been excellent, and the objective of the Code is "to protect quality." The frozen food industry is understandably alarmed at this attempt to legislate the quality of its products.

Determined that it can put its own house in order without governmental intervention, the frozen food industry has united behind its Frozen Food All-Industry Coordinating Committee in a program of voluntary self-improvement that has been unparalleled by any other industry.

Like AFDOUS, the FFAICC is drawing up a code of handling practices. Separate codes will be written by each segment of the industry — processors, warehousemen, transportation agencies, distributors and retailers. These will be integrated into an overall industry code. This code, too, is expected to specify a 0 F temperature as a maximum, but it will recognize existing realities, and will probably allow the industry to reach this goal in a series of stages over a specified period of time. It is a voluntary program and will be policed by the industry itself. Thus, supermarket chains will refuse to accept shipments above a certain temperature, in this manner policing the truckers, etc.

However, whether the AFDOUS Code or the Industry's Code is the one that is put into effect, one fact is almost a certainty. Within the next several years, the entire frozen food industry will be required to distribute its product at 0 F.

These considerations irresistibly lead to some general ideas relative to the increasing encroachment on human liberty and business enterprise, some thoughts that I believe are not only germane to this immediate problem of the frozen food industry, but to the entire sphere of human activity.

What the Consumer Wants

MISS DOLORES PALMER
Home Economist & Special Representative
Frozen Potato Products Institute

Convenience, quality, nutrition and economy will be covered.

MEDIUM TEMPERATURE WATER HEATING SYMPOSIUM—TUESDAY, FEBRUARY 14, 9:30 A.M.

At Medium Temperatures

L. BOUILLON
Chairman
Bouillon, Griffith, Christofferson & Schairer

Included in the remarks will be economic reasons for use of increased temperature drop leading to the medium temperature water system, the effects of increased supply temperature and temperature drop on heat transfer selection and control. Also considered will be medium temperature system economics; mechanical selection, including pump selection for medium temperature (high temperature drop) system, pumps, boilers, piping and pressurization methods.

Economies of Increased Temperature Drop in the Design of Hot Water Heating

This paper will deal principally with actual experience in the use of primary-secondary pumping and the possible deep temperature drop available as a design concept for hot water heating. An attempt is made to show how this concept presents installation and operating cost economies of major consequence when compared with other commonly used systems.

Simplicity of control, minimal power consumption, ease of passage of piping through structures, minimal heat vagrance, light weight and ease of support, simple provisions for expansion and contraction, simple boiler circulation and similar points of advantage will be discussed with a minimum of technical reference.

HOMER BIRD
Bird, Bird & Associates

Effect of Small Water Quantities on Heat Transfer Selection and Controllability

SAMUEL W. MILLER, JR.
Chief Development Engineer
John J. Nesbitt, Inc.

This paper will describe the effects of small water quantity design on the selection and control of heat transfer equipment for medium temperature water systems and will discuss the possible economies and associated application.

The subjects to be considered are the effect of higher supply water temperatures on water quantities, materials, and circulating required for heat transfer elements, relative influence of heat transfer surface designed for small water quantities on system economy, comparison of design temperature drops possible with low, medium and high temperature water.

Also, commonly employed control methods, throttling and three-way valves, air bypass, secondary pumps, heat exchangers, outdoor reset control, as well as the influence of small water quantities and higher temperatures on controllability of valve controlled equipment. Heat emission versus flow for various design temperature drops, valve characteristic and pressure drop requirements along with application, design precautions, prevention of freeze-up, corrosion and other failures will be included.

Pump Selection and Pipe Pressure Drop Curve Application for Medium Temperature: High Temperature Drop Heating Systems

G. F. CARLSON
Chief Engineer
Specialty Div.
Bell & Gossett Co.

This paper will cover the meaning of a pump and pipe pressure drop curve. The effect of water temperature on the curve and the pump H.P. effects of the curve will follow.

Pressure drop addition for supply and return piping (high temperature drop) and pump location effect on pump selection point will be considered, and the last point will be final pump selection by the system curve.

Medium Temperature Water Economics, Selection Criteria and Pressurization Methods

R. M. HARMON
Consulting Engineer
Harmon & Beckett

The paper will include a comparison of medium temperature water with steam. Also specific equipment selection; boiler, pipe and fittings, valve and pumps; and pressurization methods will be considered.

AIR CONDITIONING SYMPOSIUM — TUESDAY, FEBRUARY 14, 9:30

Humidity, Humidity Control, Air Motion and Movement

There are many subdivisions and directions for the general subject of our symposium. During the last several years, much more emphasis has been put on such things as humidity and its control, air purification, air cleaning and handling, filtering, odor masking, etc., than in the past. Customers have now been made more aware of these elements and their relation to air conditioning.

Also there is a factor of timing here. Our customers are more astute, more critical of the value they are receiving for their dollars. These other elements then appear to be plus features in air conditioners they were not getting that are now available.

W. R. MOLL
Chairman
Sales Manager
Air Conditioner & Dehumidifier
Sales—to Sears
Whirlpool Corp

The prominence of the so-called "Comfort Index" has made humidity a more or less everyday word. The work of the ASHRAE Central Research Group in this area has produced valuable new data that will be available soon. Our speakers have each specialized in a phase of these new ideas.

Comfort and Physiological Adjustments of People to Environment

M. K. FAHNESTOCK
Research Professor of Mechanical Engineering
Chairman, Physical Environment Unit
University of Illinois

Today in the United States year 'round comfort is commonly experienced by a large proportion of the population in public buildings, in many homes and in some factories.

For sedentary and slightly active people thermal comfort involves a balance between their metabolism, or the heat produced within their bodies, and that lost to their surroundings, without free sweat being present and without their feeling noticeably warm or cool.

Air temperature, relative humidity and velocity, surrounding surface temperatures, clothing and skin temperature affect the heat loss from people to their surroundings. Most sedentary or slightly active healthy people are thermally comfortable at any time of the year in uniform environments when the air temperature is 73-77 F, the relative humidity 25 to 60 per cent and the velocity is 40 fpm or less.

For small changes in metabolism and in environmental conditions the vaso-motor regulation of skin temperature serves to keep the heat loss from the surface of the body in balance with the heat production. Within the range of comfort and vaso-motor regulation only the effect of relative humidity on thermal comfort is very small. The adjustments in the heat regulatory mechanisms of healthy people to rapid changes in environment, such as going into and out of air conditioned spaces are prompt, easy and safe.

Physical activity affects heat production. Additional data are needed on the proper levels of temperature, humidity and air motion for workers, and on the physiological adjustments of people working at different rates under different environmental conditions, including their latent and sensible heat losses.

Air Motion and Movement

RALPH G. NEVINS
Professor and Head
Dept. Mechanical Engineering
Kansas State University

An air conditioning system must not only be designed to absorb the proper heating and cooling loads and provide proper ventilation, but must also distribute the conditioned air, without drafts, to provide a comfortable, uniform environment within the entire space. The factors which effect the distribution of conditioned air within the space include, air temperature, grille velocity, grille location, room size, room length, deflection vane angle and grille type.

Previous investigations of air distribution factors and system evaluation by Case Institute of Technology, University of Illinois, Kansas State University and others, which have been reported in the literature, are outlined and the significant conclusions emphasized. Currently at Kansas State University, a study of the use of model enclosures to evaluate the performance of grilles and distribution systems is underway. Correlation of model data with full scale results is being attempted to provide scaling factors. Motion picture films of the model tests will be shown to illustrate the manner in which data are obtained.

A criteria for evaluating the performance of an air distribution system within a space, based on comfort considerations, is discussed. Discomfort due to drafts usually depends on two factors: (1) difference between the moving air temperature and the bulk room temperature and (2) the air velocity. Re-evaluation of 1938 comfort data and the determination of the effect of air motion on comfort has been included in the Society's comprehensive environmental research program by the Research Panel on Physiological Research and Human Comfort.

Humidity Controlled Air Conditioning

RICHARD SIGNORELLI
Asst. to Vice President, Manufacture
Mueller Climatrol

There will be brief discussion of considerations which led to our decision to design and prepare to sell a unit for the residential and light commercial air conditioning market which would control both sensible temperature and relative humidity.

Three or four possible design approaches, which were considered to accomplish the desired results, will be shown, and the advantages and disadvantages of each approach indicated.

The problems encountered during the development phase of the program and a review of all development testing, leading to the final selection of the system circuitry to be used, as well as the ultimate selection of components will be presented. Emphasis will be placed on the considerations and problems encountered in the sizing of various components of the system in order to obtain the desired performance characteristics. Schematic diagrams covering the refrigeration circuitry for cooling and dehumidification will be passed out and explained to the group.

Also included will be a brief discussion relative to the sales achieved with this equipment and the performance results of several installations.

WHAT IS THE REAL CRISIS IN EDUCATION? PAGE 33

Design and Development of a Dehumidify-reheat Cycle Room Air Conditioner

FREDERICK T. APPEL
Projects Manager
Air Conditioners and Dehumidifiers
Whirlpool Corporation

For many years cooling has been the primary accomplishment of room air conditioners. A welcome by-product of the cooling action has been a varying measure of dehumidification, but being a by-product, the dehumidifying action has been largely uncontrolled. Often it is not available at all when it is most needed. This is especially true during mild weather when humidity is high, or when an air conditioner has more cooling capacity than is required by the conditioned space.

In large commercial installations this problem is solved by chilling the air to well below the dew point to remove part of the water vapor present, and then reheating the air to comfortable dry bulb temperatures with hot water or steam coils. Recently a refrigeration system was developed at the Research Laboratories of the Ranco Corporation which can accomplish a dehumidification and reheat operation without a supplementary heat source. This system requires a divided refrigerant circuit in the evaporator coil and a means of redirecting the refrigerant flow in the coil. During the cooling cycle, both portions of the evaporator serve as cooling coils. During the dehumidify and reheat cycle, one portion of the evaporator serves as a cooling coil, and the other portion (employed as a condenser) serves as a reheat coil.

The air conditioner was designed to operate at maximum efficiency on the cooling cycle at Nema standard rating conditions. The design point for the dehumidification and reheat cycle was selected as 80 F and 50% RH, inside and outside conditions, since it is expected that the air conditioner will operate on this cycle a greater percentage of the time at these mild temperatures than it will when conditions are near the cooling operation design point. A humidity control, as well as a temperature control, has been provided so the air conditioner will not operate unnecessarily when the conditioned space reached the conditions desired by the user.

The dehumidifying capacity of this machine is far greater than any household dehumidifier now on the market, and it will not raise the temperature of the conditioned space while dehumidifying. The cooling capacity of the air conditioner is not compromised by the addition of the dehumidify-reheat mechanism.

DOMESTIC REFRIGERATOR ENGINEERING SYMPOSIUM—WEDNESDAY, FEBRUARY 15, 9:30

E. J. VON ARB
Chairman

Vice President in Charge of Engineering
Revco, Inc.

Practical Application of Foamed Insulation in Industry

C. W. NEWHALL
Martins Sweets Co.

Specifications for foaming installation and some basic facts concerning foam material, the product, and the application method will be covered. Also, some of the functions of equipment relating to resulting foam, which can assist the foam product manufacturer to determine application method and mixing requirements will be considered.

Intermittent Foaming

A. H. HERMANNS
Admiral Equipment Corp.

Under discussion will be desirable properties and maintenance equipment and their relationship with intermittent foaming, as well as mixer for producing proper foam.

Theoretical Aspects of Foam Insulation

P. A. SANQUINNETTI
Group Leader, Foam Technical Service
Mobay Chemical Co.

A discussion of rigid urethane foams that will include the background in chemistry, raw materials involved, different processes for producing urethanes (from the chemical rather than mechanical side), physical properties of the foam with emphasis on thermal and mechanical properties will be held.

NWAHACA HOLDS CUSTOM-ENGINEERED JOBS TO BEST SUIT THE NEEDS OF THE USER PAGE 62

Bagged Insulation

ROBERT BILEK
Associate Design & Development Engineer
Hotpoint Co.

This will be a description of a research and development program on materials and processes which resulted in a thin wall insulation producible for present day domestic type refrigerators and freezers.

Design Requirements for Thin Wall Refrigerators and Freezers

SEVERN JOYCE
Manager, Appliance
and Equipment Sales

MARION HOLLINGSWORTH
E. B. FRANKENHOFF
Owens Corning Glass Corp.

The paper will cover the extensive test performed to determine minimum cabinet wall thickness for heat transfer perpendicular to the surface with various insulating materials. It included not only mathematical computation but also the confirmation of mechanical determinations.

Flexibility in Equipment

WILLIAM J. NEARY
Jennings Machine Co.

This talk will present recent developments in hydraulic transfers and self contained units.

Performance Determination in Installed Systems

J. BARRIE GRAHAM
Chairman
Director of Research
Buffalo Forge Co.

This symposium will cover some of the problems encountered in checking the actual performance of a ventilating system. The technical literature contains excellent information for the design engineer, but this information is of little value unless the required results are achieved in the actual installation.

Field Check of Ventilation and Air Conditioner Systems

JAMES BRICKER
Member ASHRAE
Charles S. Leopold, Inc.

The consulting engineer is responsible to the client for the design, for the checking of shop drawings, for field supervision and, most important, for the end result to produce the desired conditions whether to be for comfort or industrial air conditioning. In performing this service, he establishes the criteria, prepares contract drawings indicating clearly the intent of design, provides written specifications describing the materials to be furnished and installed, the method of installation to be employed, and performance data for the equipment, such as fans, filters, coils, refrigeration machines, etc.

The contractor is responsible for the installation of the system as designed, furnish equipment per specifications, etc. He is not responsible for the design conditions (such as 75 d. b. and 50% R. H. when 95 d. b. and 78 w. b.). This is solely the consulting engineer's problem, assuming the contractor has met his obligation as per design, equipment, etc. The concontractor, of course, must prove the equipment furnished will perform as specified. The equipment manufacturer is also responsible to the engineer through the contractor.

It is important that the consulting engineer give some thought to the system checking procedure, so that adequate provisions may be made during the design period for measuring stations for flow, temperature, pressure, power, etc. It is important to consider the accuracy of field testing so that an acceptable tolerance may be established for comparison of the test results to the specifications. The contractor must assume some responsibility for the performance check of the system.

Industrial Ventilation Systems

K. E. ROBINSON
Member ASHRAE
Ventilation Engineer
General Motors Corp.

It is advisable to establish certain standards for the initial operation of industrial ventilation systems and establish a routine checking system to assure its continued operating efficiency. Most industrial plants faced with the problem of constantly changing ventilation requirements due to the changes in plant layout, product, process, etc. In this case it is important to establish a procedure for

system alterations. Changes must be authorized by certain qualified personnel and decisions must be made as to the relative merit of system alterations vs installation of a new system. While actual details of procedures to accomplish the above will vary from plant to plant, it is possible to establish a general outline for such a system.

The system check-out procedures are greatly simplified by properly established design criteria. There are, for instance, definite advantages in using an equal pressure system to obtain system balance rather than to depend on the adjustment of blast gates. It can be shown that the equal pressure method has advantages in both the original installation and in answering the problem of operating costs in its various aspects.

The checking procedures for an industrial exhaust system need not be complicated. Flow conditions may be quite adequately checked with the standard pitot tube and manometer arrangement. This arrangement has some advantages over more elaborate instrumentation.

Ventilation Systems with Special Requirements

R. J. WALKER
Member ASHRAE
Plant and Process Eng. Group Leader
Rocky Flats Plant of Dow Chemical Co.

Some industrial operations, such as those associated with the atomic energy field, have ventilation system requirements that are quite severe. In order to meet these requirements it is often necessary to incorporate special checking facilities into the system. This not only permits initial check-out procedures but also provides constant surveilance since in some of these systems, occasional routine checks are not adequate. The design of such checking facilities requires a thorough knowledge of design methods and an extensive experience with operating systems. The engineer must provide not only a good design and good equipment but also a truly efficient operating entity.

By necessity, industrial operations of this type require large quantities of air and it is important to consider various methods of obtaining economical operation. Design criteria must be carefully established, air flows arranged so that treated air is used in more than one area before being discharged to the atmosphere, and the system provided with a flexibility that will permit operation under several conditions. Also thought must be given to the possibility of equipment failure and the necessary precautions that must be taken.

FORUMS

R. S. BUCHANAN
Chairman

Forums offer highly informal discussions for the exchange of ideas. There are no prepared papers or talks, no notes or minutes are taken, it is all "off the record." Our guests of the press respect the spirit of the forum. Here is an excellent opportunity to exchange and discuss ideas and opinions.

Six diversified subjects will be covered at the ASHRAE Chicago Semiannual Meeting. These were selected on the basis of popular interest expressed from various sources. The forums to be presented, and their moderators, are as follows:

Transport Refrigeration

This forum will consider the need for transport refrigeration, the reason the subject is complex and what the goals are in relation to the preservation of food.

Several problem areas will be discussed. The variety of processing methods causes confusion; it is necessary to define storage and transport needed for food and to consider the variables in initial quality characteristics of fresh products. Differences in equipment and methods of transportation (often inadequate) will be brought up. For example, there is a lack of instruments for indicating temperature history of foods and an absence of standards for transportation equipment and storage temperature requirements, as well as a lack of grading schedules for products at the retail level. Other difficulties are the discontinuity in responsibility for care of frozen foods, lack of knowledge in operators, and the relation of labor problems to food handling.

This forum will try to place responsibility for improving the present situation, discuss progress being made and assess where and how further effort is needed.

P. R. ACHENBACH
Chief, Mechanical Systems Section
National Bureau of Standards

A New Psychrometric Chart

JOHN EVERETTS, JR.
ASHRAE 2nd Vice-President
C. S. Leopold Co., Inc.

The purpose of this forum is to acquaint the user task group with the charts proposed by the psychrometric panel, so that the task group may work our problems from the charts and express opinions about them, thus enabling the panel to decide which chart should be adopted officially.

Better Environments for Learning

J. D. KROEKER
Consulting Engineer
J. D. Kroeker & Assoc.

The forum on Better Environments for Learning will discuss traditional standards of atmospheric environments of schools, recent information on proper environments for learning, and means of providing such environments. Experiences with respect to costs of education and the proportions thereof affected by provision of proper atmospheric environments will be discussed. Means of developing wider recognition in significant areas of the importance of proper environments for learning will be explored.

Corrosion of Air Conditioner Components

C. O. HUTCHISON
Manager Market Div.
Industrial Paint Div.
Glidden Co.

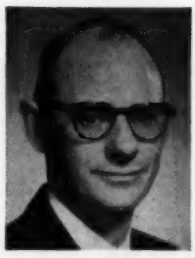
This forum will be an open and unrecorded discussion of the current and past corrosion problems on window type room coolers. Materials of construction, metal preparation, finishing systems, acceleration and field testing, and interpretation of results will be discussed for those interested. All members are invited to bring their problems or questions.

Soldering, Brazing and Welding Techniques for Aluminum

Purpose of this forum is to share the experiences in joining aluminum components. There are some new developments where only a few companies have used the materials that could be of more general interest. No doubt problems have arisen in joining aluminum and solutions may be suggested to reduce these complaints and cut costs. Joints between aluminum and dissimilar metals as applicable to refrigerating and air conditioning apparatus will be discussed.

A. J. HAYGOOD
Appliance Section, Sales Development Div.
Aluminum Co. of America

Status of Thermoelectric Refrigeration



G. D. HUDELSON
Development Dept.
Carrier Research & Development Co.

This forum will be a summary of developments in thermoelectric device design, construction and performance relative to refrigeration and air conditioning. Discussion will cover papers presented at the Symposium on Thermoelectric Energy Conversion, Dallas, Texas, January 8-12.

IN COMING ISSUES

February	Show Issue for 15th International Heating and Air Conditioning Exposition. Floor Plan. List of Exhibitors and Booth Numbers.
March	Report Issue with news of the Semiannual meeting, pictures of speakers and of social events and honor awards.

Suppression of Pulsations

in oil-fired residential heating equipment

C. F. SPEICH

A. A. PUTNAM

Elimination or suppression of pulsations in oil-fired residential heating equipment has been a goal of the oil-heating industry for many years. Trial-and-error approaches have resulted in many "cures" for pulsations which have been effective in specific instances. However, some cases of pulsation are found not curable by these techniques. Also, the mere availability of a "quick-fix" technique does not eliminate the cost of the service calls to alleviate pulsation problems. The real need has been for a more fundamental understanding of the causes of pulsations, so that antipulsating characteristics can be incorporated directly into the burner when it is manufactured. To obtain this more fundamental understanding, a research program was initiated at Battelle Memorial Institute in May, 1954, by the American Society of Heating and Air-Conditioning Engineers, Inc., the Oil-Heat Institute of America, Inc., and the American Gas Association.

A previous paper in this series has outlined a proposed mechanism for generation of pulsations in oil-fired heating equipment.[1] The mechanism has been shown to be complex, involving the proper phasing of an acoustic pressure oscillation and a periodic rate of heat release. Pressure oscillation arises from an acoustical resonance condition in the furnace-burner system, whereas the periodic rate of heat release arises from a periodic ignition of the combustible mixture. This ignition appears to be contingent on the local air-fuel ratio and presence of recirculated hot combustion products in a critical ignition region downstream of the blast-tube exit. The periodic heat release supplies energy to drive the pulsation while the acoustic pressure oscillation periodically sets up conditions for pulsed heat release.

This paper on suppression of

TABLE 1—SUMMARY OF PULSATION SUPPRESSION TECHNIQUES

Techniques	Remarks
Changes Affecting the Acoustic Pressure Oscillations	
Venting of the Combustion Chamber	By relieving acoustic pressure in the combustion chamber, large decreases in the excess air can be made without incurring pulsations.
Acoustic Filers	Because pulsation frequencies are low (15 to 40, cps), large physical volumes are usually required to suppress pulsations. These large sizes make this method generally impractical.
Changes Affecting the Periodic Heat Release	
Fuel Spray Pattern	This common technique can suppress pulsations if large enough changes are made in spray angle or pattern.
Burner Air Pattern	Not enough is known about this technique to make quantitative predictions of its effectiveness. Present changes are made on a trial-and-error basis.
High Δp Across Choke	Pressure drops of the order of 2 in. of H_2O may be required to isolate the burner acoustically from the furnace by this technique.
Fine-Scale Turbulence	No quantitative information is available by which good mixing can be predicted with minimum noise generation.
Fan Characteristics	Pulsation suppression, which is usually accredited to fan changes, is more likely due to simultaneous changes in the acoustical system.
Recirculation	Some recirculation-type burners have been reported to operate quietly after recirculation has been fully established. The effect of the recirculation on the pulsation and combustion noise amplitudes has not been established, however.
Flame Stabilization	By affecting the velocity gradients of air, fuel, and recirculation patterns, steady combustion can be achieved over wide ranges of air-fuel ratios.
Miscellaneous	
Room Acoustics	If the enclosing room becomes active in amplification of incipient pulsation or combustion noise from the furnace, a relocation of the heating unit or partitioning in the room may be necessary.

C. F. Speich and A. A. Putnam are with the Battelle Memorial Institute.

This paper was prepared for presentation at the ASHRAE Semiannual Meeting, Chicago, Ill., February 13-16, 1961.

pulsations in oil-fired heating equipment is the last of a series covering the results of the research program. It discusses suppression techniques which were investigated in this program or have been described in the literature.

DISCUSSION OF SUPPRESSION TECHNIQUES

Table I summarizes a number of different suppression techniques. Items have been grouped as affecting either the acoustic-pressure oscillation or the rate of heat release. Generally speaking, the frequency and amplitude of the pressure oscillation are dependent upon the design of the combustion chamber and flue passages, whereas the periodic heat-release rate is dependent upon the design and performance of the burner. Although phasing between the acoustic-pressure oscillations and the rate of heat release will also be affected by these various techniques, it probably is not possible to control this phasing to a degree necessary to suppress pulsations.

ACOUSTIC PRESSURE OSCILLATIONS

Generally, pulsations can be suppressed by either increasing the frequency or decreasing the amplitude of the acoustic pressure oscillations. As frequency of oscillation is equal to one of the natural frequencies of the furnace-burner unit, it can be increased by decreasing the furnace size. If the frequency were raised to a sufficiently high value, the fuel oil probably could not burn at a rapid enough rate to release heat at the proper time to sustain the pulsation. Also, high frequencies can be damped out more rapidly than can low frequencies by the internal configuration of the furnace. Sufficiently large frequency changes, however, are not normally practical because unit size is usually determined by such factors as heat transfer and volumetric heat-release rates, and, therefore, is not easily compromised for frequency changes.

Amplitude of oscillations can be decreased by increasing damping losses of the furnace-burner system. Through damping, energy is removed from the oscillating system by acoustic radiation, frictional losses, or flow resistance. Acoustical radiation can occur when noise leaves the system through an opening in the furnace. To a listener outside the heating unit, the opening may appear to be a noise source. On the other hand, if this loss in acoustic energy prevents pulsation, a net gain in reducing the total noise output of the furnace-burner unit is achieved.

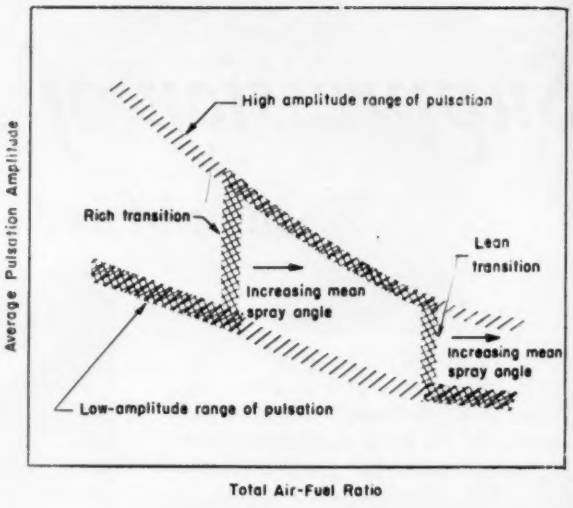


Fig. 1 Low- and high-amplitude ranges of pulsation as related to a solid air pattern and typical amplitude observations for one nozzle

Frictional losses occur in small openings where viscosity effects of fluid predominate. Sanders and Lawrie[2] have presented an equation for determining the magnitude of this loss. They also give an equation for predicting the magnitude of an acoustic resistance due to fluid flow in the burner tube or flue passages. This last resistance can provide some degree of acoustic isolation among the various components of the furnace-burner system.

Practical application of these damping techniques to oil-burning heating equipment has consisted of intentional venting of the combustion chamber, and use of acoustic filters in flue-gas-handling parts of the furnace.

Venting the combustion chamber—To paraphrase an article in the trade literature,[3] to stop pulsation—drill one hole in the front of the furnace. If that doesn't work—drill two holes! Based on this example alone, one might place little confidence in the technique of suppressing pulsations by venting. On the other hand, venting has been used successfully by the industry as a means of preventing pulsation.

Glendenning [4] has reported the pulsation suppression effect of a venting device consisting of a series of ports concentric with the blast tube; a shutter allowed the vent area to be varied. Glendenning suggested that admission of secondary air through these ports prevented the formation of low-pressure surrounding the flame region. However, in view of additional information now available, it seems more likely that acoustic effects were responsible for the success of the device.

Recent work by Weeks and others [5] has shown that an optimum venting area exists for a given furnace-burner unit to achieve suppression of pulsations with a minimum loss in efficiency or production of smoke. Using their technique, venting is achieved by placing a series of fixed-area ports in a ring concentric with the blast tube of the burner. The axes of the ports are parallel to the burner axis. In a succeeding paper,[6] Sage and Schroeder have indicated that beneficial effects of venting are derived from an acoustical effect rather than the net influx of secondary air. Their conclusion was based on an experiment in which the percentage of excess air at which pulsation commenced (comparable to the "lean transition point" defined in a previous paper of this series[1]) of venting and nonventing. A special vent plate which had several holes manifolded to an auxiliary air supply was installed. Equal amounts of secondary air were fed into the combustion chamber during both venting and nonventing conditions. The percentage of excess air at which pulsations were eliminated was lower for vented than for nonvented combustion chambers. On

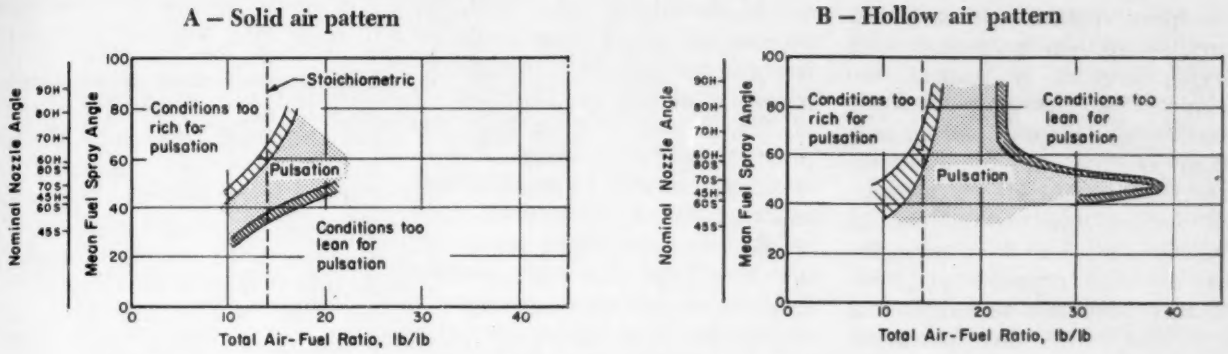


Fig. 2 Nozzle-spray angles affect pulsations at various air-fuel ratios

the other hand, supplying additional quantities of secondary air through these ports produced an increase in the percentage of excess air at which pulsations ceased. Thus, the presence of secondary air negated the benefits of venting.

During the experimental phase of the Battelle program, an observation was made of the effect of unintentional combustion chamber venting by cracks and leaks in the chamber wall or the joint between the burner and furnace. It was found that sealing these cracks caused a large increase in the pulsation amplitude from one burner, characterized by a solid air pattern, but the same care in sealing had little effect on noise from another burner, characterized by a hollow air pattern. In an attempt to explain this large effect of leaks on the pulsation amplitude from the first burner, the possibility of secondary air influx, changes in the system's natural frequency, or increases in the damping losses in the furnace-burner system were considered. Insufficient data were available to ascertain which of these was the real cause of the observed amplitude change.

In summary, it can be said that the effect of venting the combustion chamber is to retard build-up of an acoustic oscillation, and thus, to allow the burner to operate at lower percentages of excess air than would be possible with the unvented system. The extent of reduction in percentage of excess air which is possible without pulsation, objectionable smoke, or large decreases in efficiency will depend on the burner-furnace unit.

Acoustic filters—Use of acoustic filters has been suggested as one means of achieving an apparent suppression of pulsations and combustion noise. This technique permits generation of noise, but depends on acoustical devices to attenuate the noise before it leaves the heating system.

"Handbook of Oil Burning" illustrates three techniques by which the flue system can be modified to reduce the amplification of combustion noise and pulsations.

These techniques can be interpreted as being (1) use of a branch on the smoke pipe to increase acoustic radiation losses of the heating system, (2) changing effective length and thus, resonant frequency of the chimney, and (3) use of a high-pass acoustic filter assembly in the smoke pipe. The last item attenuates low frequencies of combustion noise, but it allows high frequencies to pass unaffected.

Putnam and Dennis have described the use of acoustic dampers for oscillation suppression in combustion systems[8]. In particular, they discuss the application of quarter-wave tubes, Helmholtz resonators, and venting orifices as means of suppressing oscillations. Quarter-wave tubes, Helmholtz resonators and large diameter orifices which vented the combustion chamber to the atmosphere were found to be effective over a wide range of locations in the chamber. Small diameter orifices were found to be most effective at or near regions of maximum acoustic pressure.

Major drawback to use of acoustic filters is that they must be physically large to attenuate properly low frequency pulsation generated by oil-fired equipment. If size were no problem, however, they would be quite effective for attenuating single frequency noises, such as pulsation.

PERIODIC HEAT RELEASE

As has been suggested already, periodic variation in the rate of heat release results from a periodic ignition of the combustible mixture. This ignition, in turn, is believed to depend upon the quantities of vaporized fuel, air, and recirculated hot combustion products available in a proposed critical ignition region downstream of the blast tube exit.

To prevent pulsations, what is probably required is that the local air-fuel ratio and quantity of recirculated products in the critical ignition region be such that insufficient heat is released in phase with the oscillating pressure to sustain the pulsation. Thus, to affect the pulsation amplitude by changing the periodicity of the rate of heat release, control must be exercised over the fuel, air, and recirculation patterns. Unfortunately, in an oil burner, control exercised over these parameters appears to decrease in this same order. That is, fuel-spray angle, pattern, and quantity of fuel are regulated quite closely. This control arises primarily from high pressure drop across the nozzle which imparts a high momentum to the fuel droplets; thus, the fuel flow is isolated from pressure fluctuations in the combustion chamber. The pressure drop across the burner choke is relatively small; thus, the air-flow rate and pattern are partially controlled and there is only a partial isolation of the air supply from pressure fluctuations in the combustion chamber. In conventional furnace-burner systems, there is little or no control over the recirculated hot combustion products since they are located in the combustion chamber and are, therefore, at the mercy of the pressure fluctuations.

Fuel-spray pattern – For many years, servicemen have used, with varying degrees of success, the technique of changing the fuel-nozzle angle or spray pattern as a means of preventing pulsations. Experience has shown, for instance, that hollow-cone sprays usually give more freedom from pulsation than do solid cone sprays.[9] One difficulty with this technique has been that, with any particular burner unit, a sufficient change in angle or shift in fuel pattern to stop pulsations often results in smoke, odor, or poor efficiency.

As part of the experimental phase of this research program[1, 10], a systematic study was made of the effect of nozzle spray angle and pattern on the amplitude of pulsation.

Fig. 1 is a sketch showing the results of these fuel-spray studies. Generally, noise amplitude from the heating unit was found to decrease with increasing air/fuel ratio. However, with some spray types and angles, sudden increases from low-amplitude noise to high-amplitude were found to accompany an increase in air-fuel ratio. For still other spray types and angles, a sudden transition from a high amplitude to a low one was noted with an increase in air/fuel ratio. Studies of a large number of different angles and patterns showed that the points where these amplitude transitions occurred correlated quite well with the mean spray angle* of the nozzle.

Fig. 2 illustrates this correlation for both a solid and a hollow air cone. The figure shows regions of pulsations and indicates, qualitatively, what spray angles and total air/fuel ratios produce nonpulsation conditions. It can be noted from Fig. 2b that burners incorporating nozzles with large mean fuel-spray angles are generally free from pulsations at normally used air/fuel ratios. As discussed previously, this freedom from pulsations has been attributed to the increase in air/fuel ratio.

* In the analysis of the fuel-spray pattern, it was found convenient to replace the nominal designation of fuel sprays, namely, spray angle and pattern, with a hypothetical spray-pattern model. This model defined all sprays, regardless of angle or pattern, as a thin, hollow spray in which all of the fuel was concentrated at some effective angle. The model's effective angle of spray was defined, mathematically, as the mean angle of mass concentration of the original spray and was calculated in a manner similar to the determination of the center of gravity for a linear distribution of masses.

It should be noted that, for purposes of establishing limits for research analysis, the range of conditions examined in the summary of Fig. 2 was broader than the practical operating range of conventional burners. As an additional sophistication, another curve could be placed on the figure representing the limit for objectionable smoke, thus following the example of Weeks, et al.[5] Manufacturers who analyze their units in this general manner could interpret the results for the field serviceman and thus recommend nozzle types which would operate successfully in the desired ranges.

Air pattern—This modification represents a generally less used means of suppressing pulsations. This stems from the fact that air patterns are quite often fixed for a particular burner and thus changes in pattern would represent modifications in blast tube parts. However, there are combustion heads for which air patterns can be varied from sharply hollow to solid air cones. The literature suggests that a solid air cone has a greater resistance to pulsation than does a hollow air cone.[11] This increase in resistance can also be seen in Fig. 2 for small mean spray angles. Presence of a positive flow of air in the center of the air cone may have the effect of increasing the acoustical resistance of the blast tube.

Little definitive information is available in the literature on air patterns produced by oil burners. Manufacturers are often aware of the general air pattern produced by their burners but seldom determine, quantitatively, air pattern, either when exhausting in the open, or when the burner is inserted into a furnace. As an additional complication, periodic pressure changes within the combustion chamber will produce corresponding changes in flow patterns; this periodic change can feed back into the oscillating systems and help "lock in" the pulsation.[1] The need, therefore, exists for additional knowledge of air patterns under pulsating as well as under normal flow conditions in a furnace, possibly as determined by the use of flow tracers and high-speed movies in a modified furnace. This information would also be of great value in optimizing fuel and air mixing.

High-pressure drop across choke—As a means of increasing acoustic resistance in the blast tube, Sanders and Lawrie[2] have suggested the use of a large pressure drop across the choke. Measurements made as a part of this research program indicated that pressure drops across the choke of a burner under nonpulsating conditions were of the order of 0.4 in. of H_2O. On the other hand, sound-pressure levels of the order of 140 db have been measured within the combustion chamber during pulsating conditions. In terms of an instantaneous pressure, this sound-pressure level represents a swing in peak pressure of about 1.1 in. of H_2O above and below the ambient pressure. This high oscillating pressure explains why back flow into the blast tube has been observed in some high-speed movies in this program. By increasing the pressure drop across the choke, the effect of oscillating combustion chamber pressure on the air-flow rate from the blast tube would be decreased. Because geometric changes might have an unexpected effect on the pulsation amplitude,[12] it is assumed for this discussion that means of obtaining the high-pressure drop does not alter the geometry of the air pattern.

Turbulence—Sanders and Lawrie[2] have accredited turbulence as the major source of low-frequency noise in oil-fired burners. It causes the random fluctuations in burning rate of the flame which can produce random combustion noise. Also, periodic vortex-type turbulences can be produced which can "lock in" with the resonant frequency of the furnace-burner system and produce a periodic air flow and, therefore, pulsations. Sanders and Lawrie suggest the generation of small-scale, instead of large-scale, turbulence by the burner. This small-scale turbulence would permit adequate mixing of fuel and air but would die out rapidly enough so as to provide smoother combustion. Unfortunately, at present it is not known what scale of turbulence is needed to produce this adequate mixing with a minimum in the production of fluctuations in the burning rate of the

flame. Means of producing small-scale turbulences are outlined in the appendix of their paper.[2]

Fan Characteristics—In the past, burner-fan characteristics have been blamed for many pulsation and noise problems of burners. Forward-pitched fans have been shown to be the source of unwanted, noise-producing turbulence.[2] There is also an indication that many fans operate near or in an unstable region of their performance curves. The combined presence of turbulence, which can produce random fluctuations in the heat-release rate of the flame, and an air supply, which borders on instability, suggests a system which would be sensitive to pulsations.

Several studies have been made, in which the burner fan was removed and combustion air was supplied to the burner from an external air supply. For instance, Baker investigated this system as a final phase of his study of oil-furnace pulsations.[13] He supplied compressed air directly into the blast tube with the burner fan sealed off from the blast tube. Comparisons were made of the pulsation amplitudes under this condition of air supply with normal operating conditions at the same percentages of CO_2. In all cases, the amplitude of pulsation was found to decrease substantially. Using a technique similar to Baker's, Putnam and Dennis[12] conducted several tests on a series of standard blast-tube boiler combinations. In most instances, replacement of fan air by compressed air reduced the amplitude of pulsation to about half. Similar studies were also made in the present program. In one case, compressed air was supplied to the burner for combustion, and the noise output of the system was determnied first with the fan in place and running, and then with the fan replaced by a pad of glass wool to produce a uniform flow. Replacement of the fan by the glass wool pad resulted in one of the largest increases in pulsation amplitude, with only one change, that was noted in the program.

From an analysis of all available results, it was concluded that the change in pulsation amplitude does not stem from the replacement of the air supply with compressed air, but from changing the acoustic configuration at the inlet end of the blast tube.

Recirculation—Little is known of the effect of recirculation on the amplitude of pulsation and random noise in oil-fired units. One design of controlled recirculation-type burner has been reported to operate exceptionally quietly after recirculation has been established.[14] This burner has a configuration aimed at augmenting the prevaporization of the fuel. Another feature of the burner is that the residence time of the fuel in the reaction zone of the combustion chamber is longer, and the heat can be released more slowly than in a conventional unit. The capability for burning to occur anywhere within a large region of the combustion chamber, plus random timing of the burning, would appear to preclude any chance of a coupling between the rate of heat release and an acoustic pressure oscillation within the combustion chamber.

On the other hand, in at least one instance[12], pulsation amplitude was significantly increased when the path length of the recirculated products was controlled closely and adjusted to an optimum length. It is probable that the products of combustion were led in a pulsed manner back into the combustible mixture at the same time during each cycle of the acoustic pressure oscillation.

From the small amount of information available, it is quite evident that some information relating to temperature, composition, and velocities of recirculated products will be needed, before this technique could be used effectively to reduce the pulsation and combustion noise amplitudes. Other benefits, such as increased combustion efficiency, might also be derived from such information.

Flame Stabilization—It has been observed that the flame front of a gun-type burner does not always remain fixed with respect to time or space[6]. Instead, it may move randomly about, as during non-pulsating conditions, or in a periodic manner, as during pulsating conditions. One means of providing a fixed position for the flame front is to use a flameholder.

The mechanism of flame stabilization is not fully agreed upon. However, flameholders are known to perform at least two functions. First, they change the local stream velocity in such a way as to better match this velocity with the burning velocity of the fuel-air mixture. Secondly, a flameholder induces recirculation in a fixed region in which hot gases are retained and supplied into a critical region of the oncoming stream. Thus, with a flameholder, proper conditions for ignition and combustion of the fuel-air mixture are provided artifically in a fixed position. This is in contrast to a gun-type burner without a flameholder in which the air, fuel, and recirculated products must find an aerodynamically formed region where ignition and combustion can be sustained. This region will tend to float with changes in air or fuel flow patterns.

Because it is situated in the fuel-air stream, a flameholder is subject to deposit problems. These do not occur, normally, with continuously operating burners, but they have been a serious problem with intermittently fired burners such as are in residential use. Banscher[16] has patented a burner-flameholder combination for which he states that deposits will not occur as the combustion air sweeps the flameholder properly.

Another method of flameholding uses reversed jets.[17] Although not likely to be practical for residential oil burners, the concept of reverse jets does show how proper use of air or air-fuel jets can provide flame stability and avoid the deposit problem inherent with some solid flameholders.

ROOM ACOUSTICS

As has been suggested by Speich, et al.[18] and by Sanders and Lawrie,[2] the room in which a heating unit is located can sometimes amplify the incipient pulsation from the unit to an objectionable level. This condition will exist when a dimension of the room is equal to one-half (or multiple

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WATCH OUT FOR THE INFLUENCE OF UNSHADED WINDOWS UPON PERIPHERAL SYSTEM PERFORMANCE PAGE 66

Important Policy Decisions

regarding the Society's research program

At a Special Meeting on December 9, the Board of Directors approved five recommendations of the ASHRAE Long Range Planning Committee intended to assure a research program which will meet the Society's future needs, fulfill its responsibilities to the public, respond to the varied interests of the membership, and at the same time remain within the ability of the Society to finance. Specifically, the Board decided to:

Continue a vigorous research program.
Discontinue the Society Laboratory at Cleveland and dispose of it as soon as is practicable.
Conduct and sponsor research at universities and other established laboratories.
Use Society general funds for Society administration of the research program and the publication of research.
Use a Society Research Fund to finance research work through grants to universities and contracts with private laboratories. This Fund would include the present Research Fund, future contributions to the research program, and investment income from the present research reserve funds and from the proceeds of the present research assets.

This decision means that the Society will in future greatly expand its program of research grants and cooperative and sponsored contracts, to replace the program at Cleveland which has comprised by far the largest portion of our research activity in the past.

A summary of the many factors which the Long Range Planning Committee considered, and which the Board weighed in making its decision, is presented on the opposite page. I should like to urge every member of the Society to study this summary most carefully.

WALTER A. GRANT
President
ASHRAE

The Board of Directors at its June 15, 1960, meeting in Vancouver, requested the 1960-61 Long Range Planning Committee to undertake a study with the purpose of recommending to the Board a long range policy on research, to be completed prior to the 1961 Semiannual Meeting. This Committee is one of the most important General Committees of the Society.

When I appointed its membership last June, I took into consideration the absolute necessity of obtaining members with the highest possible qualifications for the job—long and devoted experience in responsible Society assignments, unquestioned integrity and reputation, special acquaintance in the field of research, and a comprehensive knowledge of the needs and operations of the Society.

Note particularly that each member has been a Director of the present or of a predecessor Society, three are Past Presidents, and three were members of the Committee on Research of ASHAE. I believe they fairly represent the major interest areas of the Society as well as occupational segments; one consulting engineer, one manufacturer's representative, one contractor, one university professor, and two manufacturers. These men have devoted a tremendous amount of time and effort in getting at the pertinent facts, and arriving at their conclusions.

The Board had the opportunity to study the Committee's report about a week before the December 9 meeting. Copies were also sent to Research and Technical Executive Committee, and to Burgess H. Jennings, our Director of Research. E. P. Palmatier and Neil B. Hutcheon, Chairman and Vice Chairman of R and T Committee, respectively, and Mr. Jennings, were all present at the Board meeting.

Twenty-one of the Board's twenty-seven members were present and spent the entire day considering and discussing facts, analysis of the facts, conclusions, and recommendations of the Long Range Planning Committee. Mr. Palmatier presented the carefully considered opinion of Research and Technical Executive Committee, and then Mr. Jennings expressed his own views in detail. As might be expected, most of the discussion focussed on the "central problem area" of whether or not to continue the operation of our own laboratory. The R and T Executive Committee urged the Board to take a long range view of the problem in relation to the purposes of the Society; but admitted that unless financial support of Society research increases above current levels, the laboratory must be abandoned. Mr. Jennings believed unequivocally that continued operation of the laboratory could be justified.

At the close of the day, the Board went into executive session

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Report on Research by the Long Range Planning Committee

J. DONALD KROEKER

Following is an abstract of Report A on Study of Research by the ASHRAE Long Range Planning Committee:

J. Donald Kroeker, Chairman
Daniel D. Wile, Vice Chairman
Frank H. Faust
Peter B. Gordon
Elmer R. Queer
Si J. Williams, Jr.
dated December 1, 1960.

The purpose of the study was to recommend objectives, scope, and methods of research by the Society.

Research programs were started in both ASRE and ASHVE about 1917, and have since been carried out in a wide variety of subjects under grants to educational institutions, under contract to private laboratories, and in the Society laboratory in Cleveland. Expenditures to date have been:

ASHVE/ASHAE	$2,874,398
ASRE	74,375
ASHRAE (through 6/30/60)	320,464
	$3,269,237

The program during the ten-year period 1949-58 was financed by:

Contributions from industry, individuals and foundations	37.7%
Contributions from the International Heating and Air Conditioning Exposition	16.0%
U.S. Government, through research contracts	9.1%
Membership dues	37.2%
Total	100.0%

The value of the Cleveland property, which is decreasing, was appraised in 1957 at $125,000. The depreciated value of building, equipment and facilities is now $114,869.

The 1960-61 budget calls for research income and expenditures of $200,000, of which $164,700 is for projects at the Society Laboratory, and $35,300 at cooperating institutions. The allotment to research from Society general funds is $80,000, which is 18% to 19% of total dues income. Under ASHAE, this was fixed in the By-Laws at 40%, but under ASHRAE the Board of Directors determines the percentage annually, and under present financial conditions has considered it to be in the best interests of the membership to reduce the allocation to research rather than to raise dues.

Contributions from industry, individuals and foundations have dropped from a previous average of 37.7% to around 20% for the past two years. Income from the Exposition has been sustained at a fairly constant level, but government-supported contracts vary from year to year and cannot be counted on to be continuously available and uniform.

The results of the research conducted by the Society cannot be precisely evaluated, but it seems unquestioned that the Society's research activities have played an important role in the remarkable growth and development of all phases of the industry since the inception of its research program. In forty years approximately 370 papers resulting from the Society's research have been published, and the latest ASHRAE Guide includes more than 150 references to the more recent work.

The question of whether the Society should remain in research and to what extent has been the subject of at least five studies, all of which have concluded that the Society is required to pursue research as an obligation to its members as set forth in the Agreement for Consolidation and in its By-Laws. However, there is no clear statement delineating the character or amount of research to be performed.

The character of research performed by the "founder societies" and other groups is limited to filling voids in information and resolving conflicts in the engineering data in their fields. Except for ASHRAE, they undertake no research in their own facilities, but act mainly to stimulate and coordinate research and to publish the results. ASME has had the most active program, at present at the level of $150,000 to $200,000 per year.

The Society's major needs for research fall within the categories of:

a. Effects of environment on humans, animals and plants
b. Energy in relation to the health and welfare of man
c. Effects of moisture processes
d. Heat transfer and storage
e. Combustion
f. Refrigeration processes and problems
g. Climatology
h. Characteristics and distribution of liquids, vapors and gases

While the present research program at the Laboratory is principally a continuation of work started in ASHAE on environment, the Committee believes that each of the above fields of interest should be considered in the development of future research programs. It also believes that the purposes of the Society will have been met adequately if research is encouraged or conducted by the Society to meet vital needs in an economic manner, where it is in a unique position to undertake such activities to better advantage than other organizations.

To attract a Director of Research and a research staff of a high level of competence, the Committee believes a minimum operating rate initially of at least $300,000

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PRESIDENT GRANT

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to address itself to two questions: (1) Should a definite decision be made at once, or should decision be deferred until a later date? and (2) if a decision now, what should it be? The Board was overwhelmingly of the opinion that a postponement would have essentially the same effect on the staff at the Laboratory as a decision to discontinue operations; and that it would be better to face the issue squarely, and either (1) accept the recommendations of Long Range Planning Committee, including discontinuing the Laboratory, or (2) reject the recommendations, and give the strongest possible assurances to the Research and Technical Committee of moral and financial support to an expanded research program which would continue and build up the Laboratory activity.

The Board then voted. The recommendations of Long Range Planning Committee were approved, with only one dissenting vote. It is of interest also that statements received from the seven members absent indicated approval by five of them, and qualified response from the other two.

Since several members of the Society have inquired about the previous affiliation of the members of our Board I believe it is pertinent to give you this information:

Former members of ASHAE	21
Former members of ASRE	15
Dual memberships	9
Total members of the Board	27

I am sure you will understand that the Board was faced with an extremely difficult decision, and that its action was taken only after much thoughtful discussion and soul-searching. The problem of the Laboratory is not a recent development. Despite some excellent research work, the Laboratory situation as a whole has become increasingly troublesome during the last ten years, particularly in relation to attracting and keeping superior leadership, and in raising the necessary funds. Moreover, the Board was unable to find encouragement that this situation could be materially improved.

The Research and Technical Committee, with the assistance of Headquarters Staff, is now faced with the formidable task of implementing the policy decisions of the Board. First, it must make arrangements to bring the work at the Laboratory to an orderly conclusion during the coming year, without sacrificing too much that is worthwhile. Secondly, it must recommend fair termination arrangements for the Laboratory staff when they are no longer needed. Third, the Committee, in conjunction with the Building Committee, should determine the most favorable disposition of the land and buildings, and the extent to which the facilities and equipment should be salvaged for use by other institutions in conducting research for the Society. Fourth, the Committee must recommend to the Board the scope and extent of the research program to be executed in each of the major interest areas of the Society for at least the next three years, and make specific budget proposals for 1961-62 and estimates for the succeeding two years; and finally, it must devise the detailed machinery for getting the work done through universities and private laboratories, and the Society committee and staff organization required to handle it most effectively.

I am certain that the Research and Technical Committee will rise to the occasion, and propose plans for the future which will assure that the Society will maintain its tradition for leadership and its reputation for high quality in the field of research. I should like to urge the membership of the Society to give the Committee its wholehearted support.

CHAIRMAN KROEKER

(*Continued from page 55*)

annually is necessary, based on operation of a Society Laboratory, rising to at least $500,000 before 1970. For the $300,000 level, it is estimated that industry contributions would have to be $110,000; for the $500,000 level, $310,000. On the other hand, a program based on operations without a Society laboratory would require minimum annual expenditures of $30,000 for administration and $80,000 for actual research work at universities and private laboratories. Both sets of figures are minimum (not recommended) costs, of significance principally in evaluating the ability of the Society to finance a program by one or the other method.

On the basis of the foregoing facts and analyses, the Committee has selected research without a Society laboratory as the preferred method of operation. It believes that the present laboratory is no longer justified because, among other reasons:

1. Its physical facilities will be inadequate for an expanded operation.
2. It is difficult to obtain the leadership and personnel required to compete adequately with the fine research facilities available in educational institutions, government agencies, and private laboratories.
3. It is unrealistic to believe that outside contributions to research can be increased to the extent necessary for the minimum expanded operation, and
4. It is impractical to increase dues to the extent that would be required.

Research with a **new** Society laboratory would require substantially higher capital investment to provide such facilities, and this would be very difficult to raise under present circumstances.

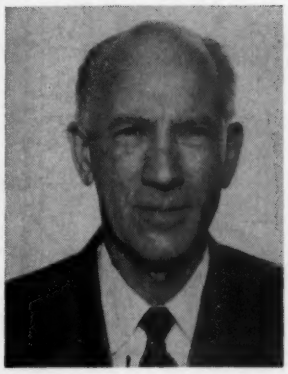
Research **without** a Society laboratory, among other reasons:

1. Requires little or no capital investment
2. Can be easily financed at a minimum operating rate, and can be expanded or contracted to meet research needs within the capabilities of the Society to finance the work
3. Enables placing research in the finest specialized facilities available and
4. Catalyzes related research, and helps develop students

(*Continued on page 102*)

Thermal Effects

of floor construction



RICHARD D. CRAMER

LOREN W. NEUBAUER

During recent years, the California Experiment Station has been using experimental structures to investigate the impact of variations among micro climates on thermal conditions inside buildings. The initial structure used was a stock wood-frame house trailer which approximated the thermal characteristics of conventional residential construction. This work has been reported in the Journal of Home Economics.[1] Subsequently two additional structures were designed and built to reflect more nearly the characteristics of contemporary houses. These are called cubicles because they are in fact cubes 8 ft on a side. One wall is glass; the roof and solid walls are made of plywood skins over a light wood frame and are insulated with two in. of mineral wool. The floor is plywood, uninsulated. A concrete slab floor can be substituted for the wood floor, and this paper is concerned with a comparison of the influences of floor construction on the thermal conditions in otherwise identically detailed and oriented structures.

The cubicles have been used to study the effects of orientation on unprotected glass structures and of shading and screening devices, in the attempt to reduce radiant transmission through glass walls. This work was reported upon before this Society in 1959.[2]

The project is a part of a cooperative regional project sponsored by the Department of Agriculture and at Davis has the active participation of an architect, an engineer, and a horticulturist, representing coordinated efforts of the Departments of Home Economics, Agricultural Engineering, and Landscape Horticulture in the College of Agriculture. Initially the objective of the project was to evaluate methods for alleviation of temperature extremes in hot, dry summers which are typical of the California central valleys and of much of the southwest. In this kind of climate, summer cooling is a more difficult problem to solve than winter heating. Midafternoon temperatures of 110 F are not unknown, 105 F not uncommon. At the same time night-time temperatures below 70 F are normal, making a 40 F diurnal spread typical. Hot days are cloudless and relatively still. Humidity at mid-afternoon is usually lower than 20%. With the rapid fall of temperature in the early evening come breezes from the south which make the evenings comfortable.

During portions of 1957 and 1958, two cubicles were operated simultaneously, with the glass wall facing south in an exposed field without shade except for a bit on the east and west horizons, and with the glass wall otherwise unprotected, in an attempt to assess the contributions of floor construction to interior thermal conditions. Specifically, the floors compared were the wood floor previously described which has a six-in. air space beneath, open to the atmosphere at its periphery, and a concrete slab poured on grade. Neither floor is insulated. Both have thermocouples in their centers, on the under and top surfaces.

In the case of the slab, the thermocouple is between the slab and the grade. In the case of the

> . . . annual behavior of the sub-floor temperatures stimulates the differences in interior air temperature patterns . . .
>
> . . . concrete slabs have the advantage of being cooler during the hot part of the day but are warmer at night . . .
>
> . . . wood floors have an advantage at night but, from June to September, this is eliminated for concrete with generous nocturnal ventilation . . .
>
> . . . all in all, there are thermal advantages to concrete slab construction over wood floor construction . . .
>
> . . . the concrete floor offers an eight-month cycle of warming and a four-month cycle of cooling . . .

1. Journal of Home Economics, Vol. 50, No. 3, March 1958, pp. 181-184.
2. ASHRAE Transactions, Vol. 65, 1959, page 499.

Richard D. Cramer is Associate Professor of Housing, Dept. of Home Economics and Loren W. Neubauer is Associate Professor, Dept. of Agricultural Engineering, University of California, Davis. This paper was prepared for presentation at the ASHRAE Semiannual Meeting, Chicago, Ill., February 13-16, 1961.

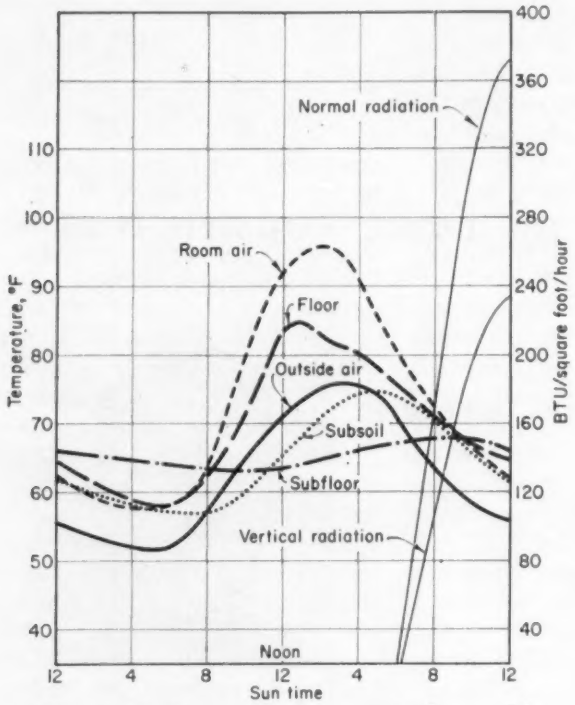


Fig. 1 Spring equinox – concrete floor cubicle temperature

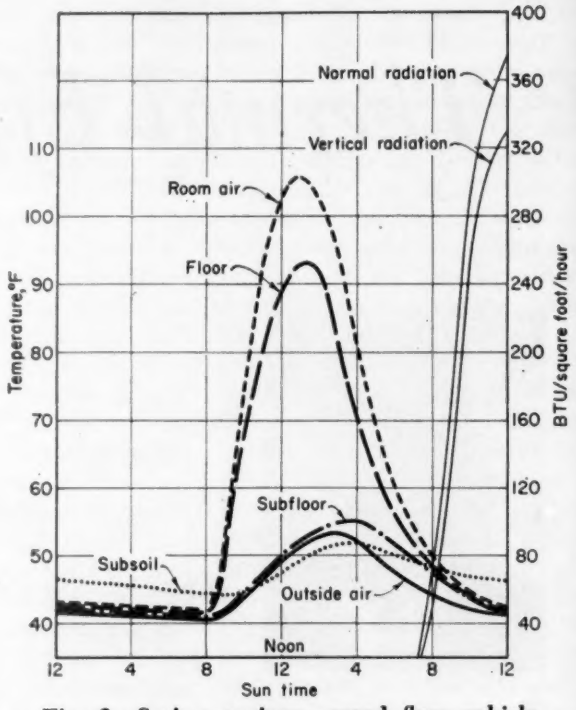


Fig. 2 Spring equinox – wood floor cubicle temperature

wood floor, it is exposed to the air of the crawl space. Thermocouples are also placed on inside and outside surfaces of all other elements of the cubicles (walls and roof), and in the outside and inside air shielded from radiation.

Measuring and recording is done with an instrument which takes a reading from each thermocouple every six min and records on a running chart. Thus, 24-hr records are available for each thermocouple, and each of the results used herein represents the average of at least three typically hot, dry, cloudless days. These tests have been performed at the solstices and at the equinoxes. Since clear weather was necessary, the clear days which occurred nearest the solstice or equinox were those used. Radiation normal to the sun, derived from pyrheliometer measurements, has been included in order to indicate that the four periods were comparable. Radiation on a south-facing vertical surface is shown as an indication of the energy to which the glass wall was exposed.

Soil temperatures four in. below the surface in an unsheltered location were taken from Davis weather station records and are included for comparison with temperatures under four in. of concrete – the cubicle floor. The results, then, can be termed spring, summer, fall, and winter conditions recorded separately for the wood floor and the concrete floor cubicles.

SPRING

The spring condition (Figs. 1 and 2) can be used to make observations about the typical behavior of the two floors. Beginning with the underside of the concrete slab (Fig. 1), the temperature is relatively constant throughout the 24-hr period, varying 5 F, with the low point at 10:00 in the morning and a high point in the early evening. The high point is the result of exposure of sizable proportions of the slab to radiation which penetrated the glass wall. The equinox sun has a vertical angle of about 51 deg at noon in this latitude. Resulting heat stored in the slab to some extent penetrated through the depth of the slab and warmed its under surface. A comparison of the temperature of the under surface and the temperature of the air in the room, indicates that the room air is cooler from 10:00 p.m. until 8:00 a.m. Therefore, the room air gains heat from the slab, or the slab loses heat to the room at night. However, from 8:00 a.m. until 10:00 p.m., the slab gains heat from the room air. That portion, which is not exposed to the sun, cools the room air by receiving heat from it. The portion in the sun gives off less heat to the air than does the wood floor, because heat flows from the concrete surface into the slab at a faster rate than it flows through the plywood floor. If the glass were shaded or if it faced North, the slab would not receive direct solar radiation. Results for this condition are now being studied as a sequel to this report.

The temperature of the top surface of the slab describes a curve which shows the radiant gain resulting from solar impingement on a portion of its surface including the thermocouple location. During the daytime hrs, the room temperature rises above that of the slab by virtue of radiation through the glass impinging on interior wall surfaces. These are plywood, rather dark in color. Because they are backed with insulation, they give off heat at a comparatively rapid rate, warming the interior air to a temperature higher than that of the top surface of the slab. And so the slab gains heat from the interior air by convection over its entire

ASHRAE HAS A VIGOROUS ENVIRONMENTAL RESEARCH PROGRAM FOR THE FUTURE PAGE 63

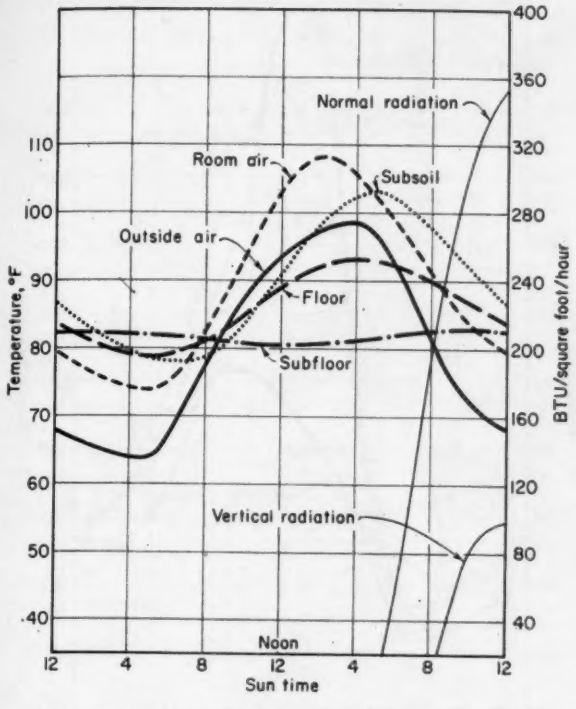


Fig. 3 Summer solstice – concrete floor cubicle temperature

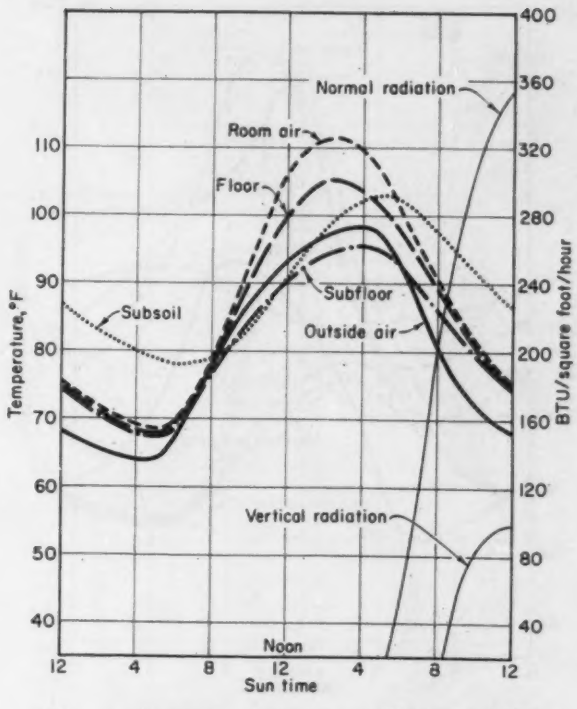


Fig. 4 Summer solstice – wood floor cubicle temperature

surface, and from the sun by radiation over a portion of its surface.

For the wood floor cubicle (Fig. 2), the temperature curve for the underside of the floor is variable during the 24-hr period, as compared with the corresponding concrete slab curve. The low point of its curve occurs at 6:00 a.m. and the high point at 3:00 p.m., and the spread is somewhat greater than 20 F. Comparing both the times and the magnitudes of the high points of the two subfloor curves, differences caused by material mass and specific heat are apparent, a delayed response in the case of concrete, a rather quick response in the case of wood. Average value of the wood curve is lower than that of the concrete curve. The area between the curves at night is substantially larger than the area between the curves during the day, making the wood floor cubicle on the whole cooler, and conversely, the concrete floor cubicle warmer.

Behavior of the top surface of the wood floor is an exaggerated version of that of the underside. Rapid increase in temperature and the narrow high point are caused by direct solar radiation through the glass onto the floor surface. In comparison with concrete, the value is higher during mid-day, and lower at night. The top surface of the wood floor is cooler than the top surface of the concrete floor for substantially more than 50% of the time.

Room temperature in the wood floor cubicle is cooler than the room temperature in the cubicle with the concrete floor from 4:00 in the afternoon until 9:00 in the morning, and is warmer for the seven remaining hrs. It can be said then, that the concrete floor cubicle produces a flatter diurnal air temperature curve inside the structure than does the wood floor cubicle, and taking the 24-hr period as a whole under consideration, that the concrete floor construction produces a warmer condition inside than does the wood floor construction. The concrete loses less heat to the soil than the wood loses to the crawl space air.

The period just described is warm clear weather at the spring equinox. The experimental structures had no artificial heat added, were not occupied, and were entirely closed to the outside air, so that infiltration was kept to a minimum. Had these structures been inhabited they would have been opened generously during the mid part of the day because room temperatures exceeded 90 F. On the other hand, it would have been to advantage to keep the concrete floor cubicle closed at night because the temperature therein remained substantially above that of the outside air. In the case of the wood floor cubicle, night-time temperatures inside and out were almost identical, and so it would make little difference whether it were open or closed.

SUMMER

On the summer solstice (Figs. 3 and 4), the temperature curve for the underside of the slab (Fig. 3) is both higher and flatter than the corresponding curve in spring. It is higher because there has been a gradual accumulation of heat in the soil under the slab, and it is flatter because the sun is steeper in June (about 74 deg at noon), and so it does not strike the center of the slab where the thermocouples are fixed. The portion of the slab that it does strike is a relatively small one.

Slight variation in the curve diurnally is caused primarily by heat which is convected from the interior air temperature to the slab. The low point of the curve for the sub slab occurs at noon, and the high point just before midnight, which when compared to the air temperature inside illustrates a delay of about eight hrs, caused by

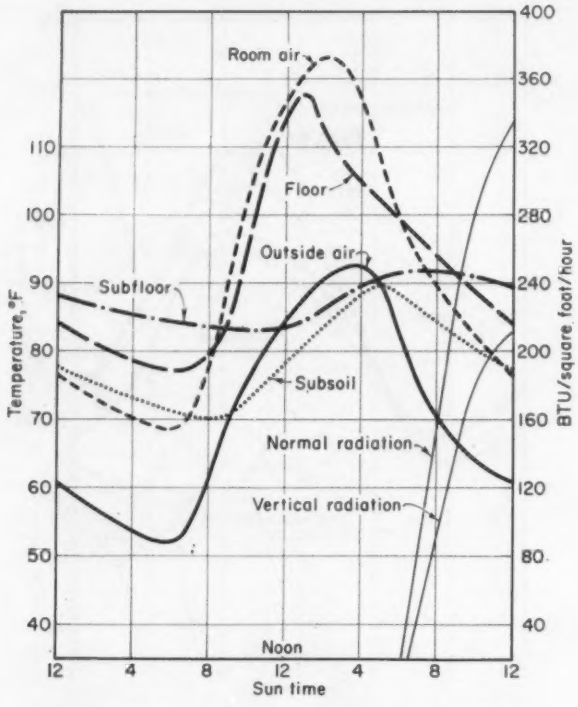


Fig. 5 Fall equinox — concrete floor cubicle temperature

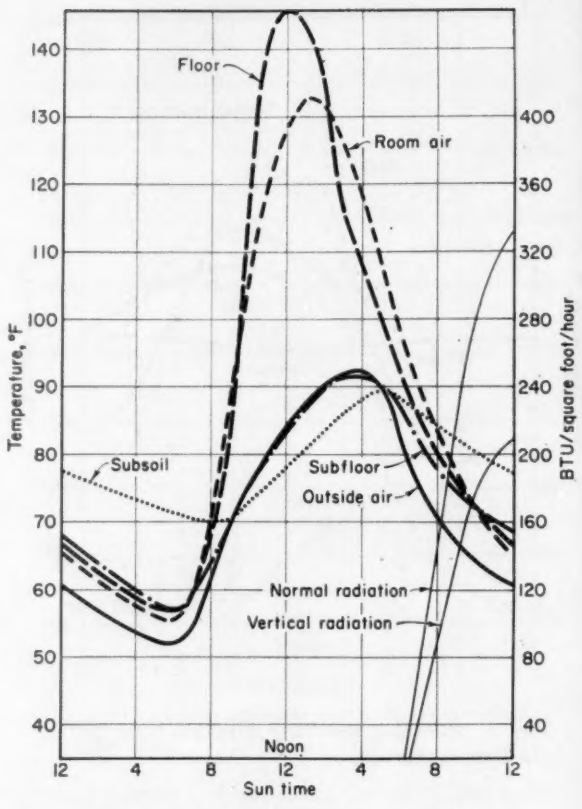


Fig. 6 Fall equinox — wood floor cubicle temperature

the mass and the specific heat of the concrete. In both the spring and summer, over the 24-hr period, heat flows from the interior air into and through the slab. In other words, the slab constitutes a heat sink.

In the wood floor cubicle (Fig. 4), the shape of the sub-floor temperature curve is quite like the shape of its spring counterpart with the exception that, in comparison with the concrete sub-floor temperature, the wood sub-floor is proportionately (over the 24-hr period) warmer in June than in March, or conversely, concrete is proportionately cooler. The relationships between outside air temperature and wood sub-floor temperature are similar March and June.

However, mid-day floor and room temperatures have reversed positions in June as compared with March, again because of steeper sun angles. For the same reason there is a smaller difference in June between the top of the floor surface and the bottom of the floor surface than in March. Less heat is being transferred through the floor construction to the crawl space underneath.

In the spring, during the night, wood floor cubicle temperatures — interior air, and the floor surfaces — are similar to the temperature of the outside air. In the concrete floor cubicle the top side of the slab and the interior air temperature are consistently warmer than the outside air through the middle of the night and early morning hrs, and the underside of the concrete slab during these same hours is higher still. The wood floor cubicle in the spring has floor and room temperatures coinciding with outside air at night, but in the summer they remain above the outside air temperature. Perhaps the reason for the spread in June as compared with March can be found in the greater diurnal spread of the outside air temperature curve itself, and in the consequent slope of the outside air temperature change which produces a lag in inside temperature changes. Looking ahead for a moment to the fall, there is exaggerated example of the summer condition, probably for the same reason.

FALL

Turning to September (Figs. 5 and 6), there are patterns in some ways comparable to March and in some ways to June. They are comparable to March in that again substantial amounts of direct radiation penetrate the cubicle and impinge on floor and wall surfaces, but at the same time the outside air temperatures are higher, a condition more like June. As a result, higher inside air and floor surface temperatures are experienced during the fall.

For the underside of the concrete slab (Fig. 5), the fall curve which again is higher than its predecessor, has returned because of radiation to a more markedly curved shape as opposed to the flatter shape observed in June. It is a sharper curve than it was in March, perhaps reflecting a steeper outside air temperature. It is known that concrete slabs lose heat laterally to the periphery in contact with the outside air.

It may also be true that, because temperature differentials between slab and soil are greater, there is a faster rate of heat transfer from the underside of the slab into the soil than was the case in March. At any rate, the low point again falls at 11:00 a.m., near the spring low point, and the high point at about 7:00 p.m., again approximating the March condition. Viewing the sub-slab temperature in re-

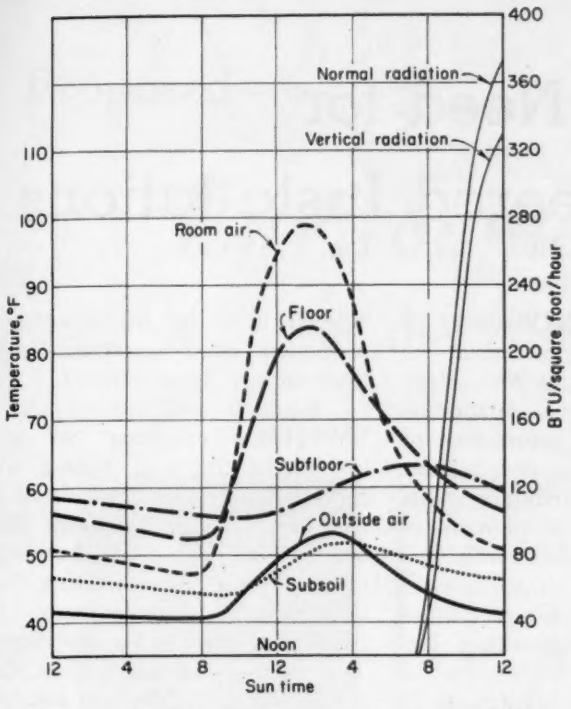


Fig. 7 Winter solstice—concrete floor cubicle temperature

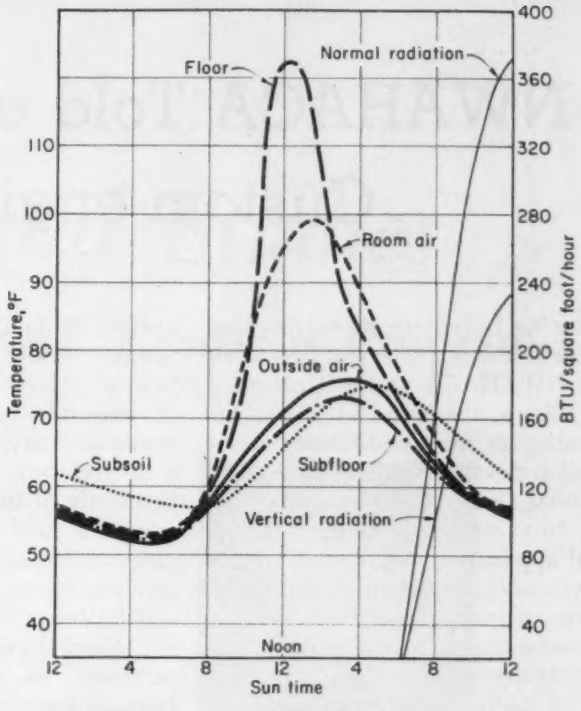


Fig. 8 Winter solstice — wood floor cubicle temperature

lation to the outside air temperature, however, in comparison with June, the average temperature of the underside of the slab has become progressively warmer than the average outside air temperature, whereas in June they were nearly the same.

In June the sub-slab temperature is below that of the outside air during most of the daylight hours and above at night, the two averaging about the same diurnal value. In September, on the other hand, the average temperature of the sub-slab is well above that of the outside air. As the summer passes the slab warms progressively.

In September all curves representing the two cubicles fall above the curve of the outside air temperature with the exception of that representing the underside of the wood floor (Fig. 6), which coincides with the outside air temperature during the middle of the day, and with the exception of the underside of the slab, for a brief period from 12 noon until 5:00 p.m. When sub-floor temperatures—concrete and wood—are compared, it is evident that concrete is warmer over the 24-hr period than wood. In April it was a little warmer, and in June the two were similar. For the top floor surface curve, the wood floor again has a tall narrow peak at mid-day, like the shape of the peak in March, because the sun is at the same vertical angle. Higher interior air temperatures are stimulated by higher outside air temperatures, whereby the rate of cooling by conduction through the glass wall and the other surfaces is slower.

The differences between the concrete slab top surface and the wood top surface temperatures are much the same as they were in March. Both curves have been raised correspondingly. Interior air temperature curves are similar in shape and in proportion to those in March, but they reveal a slightly greater difference between the wood floor cubicle air temperature and the concrete floor cubicle air temperature at mid-day.

The 40 F diurnal spread in the outside air temperature curve, however, produces substantial night-time differences. The top floor surface of the concrete cubicle is some 20 F warmer at night than the top surface of the wood floor. As a result, the air temperature in the concrete floor cubicle stays about 12 F above that of the wood floor cubicle. In March and June these differences in nocturnal air temperatures inside the cubicles was about 6 F. The September condition can be expected to represent the high season for sub-slab temperatures, and in general the high point of all of the temperatures in the study, because the summer accumulation of heat in the earth and in the air mass are combined with continuing clear cloudless days with high radiation values and with a lower sun having a noon vertical angle of 51 deg.

WINTER

Toward the end of December (Figs. 7 and 8), the sub-slab curve (Fig. 7) is shaped quite as is the corresponding curve in September. The entire slab is exposed to radiation at noon; however, the center of the slab, where temperatures were measured, had full sunshine in September, and again in December, and so the shapes are similar. In general, there has been a rapid decline in sub-slab temperature from an average of about 88 F in September to an average of about 59 F in December. This is the period of the year when the most rapid change in sub-slab temperature takes place, because from December through March and into June and then September, there is a gradual rise representing a period of nine months. The corresponding decline requires three

(*Continued on page 72*)

NWAHACA Told of Need for Custom-engineered Installations

Drawing heavily upon engineering reports deriving from research work for NWAHACA at the University of Illinois, the National Warm Air Heating & Air Conditioning Association devoted one day of its 47th Annual Convention, November 14-16, to various aspects of technical and application engineering. Other days concentrated upon the problems of and trends for dealers, manufacturers, wholesalers and management.

Closely linked discussions by Murray Patterson and James Healy covered, respectively, high sidewall outlet-fitting combinations and return air system fittings, for ducted handling of conditioned air. Each speaker presented specific findings of the Mechanical Engineering Department of the University of Illinois. As an interpretation of these, NWAHACA's Director of Technical Services Herbert T. Gilkey pointed to practical considerations deriving from this research work. It was the contention of Mr. Gilkey that neither any one group of components nor their performance could be considered properly independent of their combination as a functioning entity.

Here, as elsewhere, it was urged that the overall result of comfort, with quiet and with a pleasing amount of air motion, was the goal and that the hand-tailored job must ever be the objective of those who would fit specific facilities to the individual problems that every house constitutes; by nature of its design, construction, arrangement, location and exposure. The commenter further evaluated the findings of Speaker Patterson in terms of "why's" rather than in revelations of essential newness. Again, he would not have the return side of a ducted system considered independently of the distribution ducts and thus held the supplementary observations of Speaker Healy to a common focus.

Professor Seichi Konzo, also of the Mechanical Engineering Department of the University of Illinois, successfully undertook to dramatize the theme that there is far more to air conditioning than just heating and cooling. Indeed, he cited no less than nine individual points of control for more consideration and gave passing reference to other ones. It was clear that, in view of Prof. Konzo, the art and science of air conditioning had scarcely begun to be appreciated in the fuller terms and meaning that it must achieve before long. Prof. Konzo, seeing a world "drowning in decibels," put noise control first in his list of essential functions, followed this by temperature control as being destructively upset by the inclusions within the home of newer high-intensity and high-speed generators of heat, such as dish washers, dryers and ranges. Additionally, odor control was seen as gaining gradually in importance because of the perhaps too-tight sealing of structures. Again, moisture, drafts, individual room coolers, unitized packages, installation and service problems and the impact of extremely large installations came in for attention and comment. This speaker considered it to be his function to propound good questions rather than supply good answers.

Results of research at NWAHACA residence No. 4, as to both heating and cooling, were reported in exhaustive detail by Messrs. E. J. Brown and Boris Hryekewicz both of the University of Illinois. In interpretating these talks at the afternoon session Director of Technical Service Herbert T. Gilkey observed that a house is a complicated thermal machine; one which we can thoroughly analyze as to component and system performance and still not adequately control because of numerous variables. Again the speaker emphasized that the human element in designing and installing air conditioning facilities within a specific structure must remain the dominant one in achieving satisfactory results.

An explanation of the all-industry effort to produce a single, acceptable method of heat gain calculation was provided by Product Manager G. R. Munger of the Home Building Products Div, Owens-Corning Fiberglas Corporation. The speaker showed how joint efforts by NWAHACA, IBR and ARI, under pressure from FHA, had led to pre-eminently desirable outcome. A standard to be published jointly will be issued shortly. The topic was covered in its introductory stage in "A Simplified Procedure for Calculation of Residential Cooling Loads" by Authors W. S. Harris and E. J. Brown in the October 1960 issue of the JOURNAL.

NEXT MONTH—— ASHRAE Show Issue

Floor Plan of Booths and specially-keyed List of Exhibitors for the 15th International Heating & Air Conditioning Exposition, International Amphitheatre, Chicago, February 13-16.

Proposed

Environmental Studies

in the ASHRAE Research Program

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Member ASHRAE

CLARK M. HUMPHREYS
Member ASHRAE

As the outcome of a broad program of environmental research, undertaken at the ASHRAE Research Laboratory in 1957, under the guidance of the Research Panel on Physiological Research and Human Comfort, the following two papers reporting on certain phases of the program have been presented.

Environment Reactions in the 80 to 105 F Zone by B. H. Jennings and B. Givoni (1959)

Environmental Study II—Sensation Response to Temperature and Humidity under Still Air Conditions in the Comfort Range by W. Koch, B. H. Jennings and C. M. Humphreys (1960)

A study has also been made on the effect of air ionization on comfort and a paper on this phase of the work is now being prepared.

The seven contemplated phases of the proposed research program are listed below in accordance with a schedule adopted by the Research Panel. In setting up this schedule, the panel considered the availability of staff and facilities, and the planning and preparation necessary for each phase of the work.

The test conditions for each phase of the program are given in Table I. A bar-chart showing the estimated time schedule for the program is shown in Fig. 1. However, it should be emphasized that this schedule is an **estimate** only; some phases of the program could conceivably require twice as much time as has been indicated.

Phase 1—The Effect of Symmetrical Radiation on Human Comfort

Phase 2—The Effect of Weight of Clothing on Human Comfort

Introduction and Objectives—The objectives of the experiments to be undertaken under these two phases are to determine the effect of mean-radiant temperature on the comfort sensations of human subjects when the radiation field is symmetrical, and to determine the effect of clothing on the comfort response. Since these two phases of the program are being carried on simultaneously, they will be discussed together.

The first phase was initiated during the spring of 1960. Female subjects wearing light summer clothing were tested under symmetrical radiation conditions. These tests are being continued through the fall and winter using both male and female subjects wearing customary winter clothing. When the tests are completed, data will be available on the effect of symmetrical radiation on both lightly and heavily clothed subjects, and papers will be prepared on both phases of the program.

Test Conditions—In each test, all six surfaces of the room are held at a fixed temperature, and an air temperature is selected which, in combination with the uniform surface temperature, should produce conditions at or near the comfort level.

Phase 3—Effect of Asymmetrical Radiation on Human Comfort

Introduction and Objectives—In practice, asymmetrical rather than symmetrical radiation patterns are the rule. A room may have an outside wall consisting largely of glass, which may be cold in winter and hot in summer. In panel-heated spaces, either the floor or ceiling is maintained at an elevated temperature to offset the heat loss through exterior walls. We need to know

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how to evaluate the effects of such conditions, and should be aware of the limits beyond which discomfort is likely to result, if such limits are found to exist. The objectives of the program may be listed as follows:

1. To evaluate the effects of asymmetrical radiation on human comfort.
2. To find limiting surface temperatures, beyond which discomfort is likely to result, for floors, ceilings of various heights, and walls at various distances from the occupants.

Test Conditions—As in the case of symmetrical radiation patterns, combinations of air and surface temperatures will be set up which should provide conditions at or near the comfort level. In each test all room surfaces other than the one which is being heated or cooled, will be held at the air temperature. In tests with heated or chilled walls, the radiant environment at each subject's location will be different, and will have to be separately evaluated. A special radiometer is being developed for this purpose.

It may also be desirable during tests with a heated or cooled wall to change the orientation of the chairs so that at times the subjects are seated facing or with their backs to the wall. Sensitivities to radiation may differ depending upon the part of the body on which it is impinging.

Phase 4—Effects of Air Motion on Human Comfort

Introduction and Objective—Air motion is recognized as one of the important factors which determines man's reaction to his environmental conditions. A reappraisal of the effect of air motion is contemplated as one phase of the broad program of physiological research now under way at the ASHRAE Research Laboratory.

It is expected that the direction from which the air stream strikes the subject may have an appreciable effect on the results. It is, therefore, planned to conduct the major part of the study with the subjects facing the air stream. Short series of tests will also be made with the air stream striking the sides and backs of the subjects, to permit an evaluation of this factor.

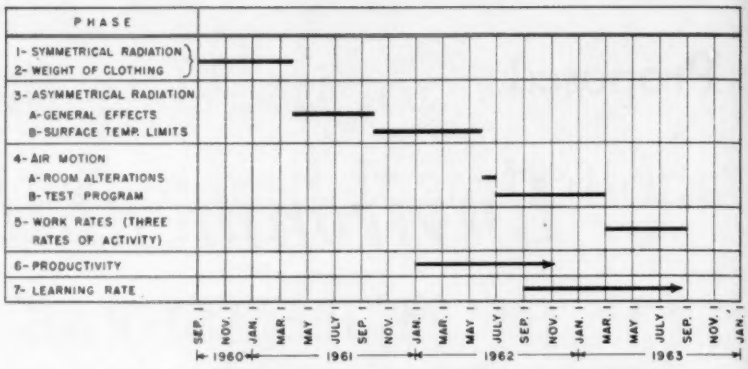

Fig. 1 Proposed time schedule for the seven phases of an environmental research program

Facilities—The present Environment Laboratory in which the tests will be made was designed to operate with very low air velocities, even when air circulation was as great as 50 air changes per hour. It will be necessary to make alterations in the room to provide the higher air velocities required for this study. The contemplated alterations will convert the room into a variable speed wind tunnel in which air velocities up to about 120 fpm can be attained.

Phase 5—The Effect of Work Rate or Activity on Human Comfort

Introduction and Objectives—The major part of the research planned in the field of human comfort will be done with the test subjects seated and at rest. Yet it is recognized that, in most air-conditioned spaces, the occupants are not at rest, but are performing a wide variety of tasks which require an equally wide range of physical exertion. It is because of this wide variation that it seems advisable to perform most of the programs at conditions of rest. However, it is important that research be conducted to determine the optimum environmental conditions for people working at various rates of activity.

Work Rates or Tasks—As previously indicated, the variation in rate of activity or type of task assignment for this study could be very broad. It seems probable that data for typical office or light assembly work might be in greatest demand. The Environment Laboratory could be readily adapted to such studies. If there is sufficient demand for data applicable to quite high work rates, it may be necessary, at a later date, to install treadmills or similar equipment.

Phase 6—Effect of Environmental Conditions on Human Productivity

Introduction—Industrial plants throughout the country represent an enormous potential market for air conditioning. Although most companies feel that they cannot justify the cost of air conditioning entirely on the basis of worker comfort, many would immediately consider its installation if it could be shown that it would pay for itself in a reasonable time through increased worker productivity.

Facilities—A study of productivity might be made, either in the Environment Room at the ASHRAE Laboratory, or in the field. Careful consideration is being given to both possibilities. Field tests would require two plants or two sections of the same plant, one of which is air conditioned, in which the same operations are being carried on by comparable worker groups.

Measurement of Productivity—For a Laboratory test program, the selection of tasks to be performed and the measurement of productivity present formidable problems. The method of measuring productivity must be such that it will evaluate only the effect of the controlled environment and will cancel out the effects of other possible incentives or deterrents. The Depart-

OIL BURNER PULSATIONS IN RESIDENTIAL EQUIPMENT CAN BE EFFECTIVELY SUPPRESSED PAGE 49

TABLE I

Test Conditions for ASHRAE Environmental Research Program

Phase	Test Variable	Room Conditions: Air Temp.	R. H.	Wall Surface Temp.	Air Motion	Subject Activity	Clothing	Data to be Taken
1.	Surface Temperatures (Symmetrical) and Weight of Clothing	As required with MRT to cover comfort range	35%	55 to 105F symmetrical	Still Air	At Rest	Typical Summer & Winter Clothing	Comfort Sensations
2.								
3.	Surface Temperatures (Asymmetrical)	As required to cover comfort range. 75-85F	35%	Asymmetrical Floor —55-100F Ceiling —55-135F East Wall —35-135F E. & S. Walls—35-135F	Still Air	At Rest	Typical for Season	Comfort Sensations
4.	Air Motion	75-100F	25-75%	Uniform. Same as air temp.	Variable Still to 120 fpm	At Rest	Typical for Season	Comfort Sensations
5.	Work Rate or Activity	70-80F	50%	Uniform. Same as air temp.	Still Air	Variable	Typical for Season	Comfort Sensations
6.	Environment	70-95F	50%	Uniform. Same as air temp.	Still Air	Variable As req'd by task	Typical for Season	Productivity
7.	Environment	70-90F	50%	Uniform. Same as air temp.	Still Air	At Rest	Typical for Season	Learning Rate

ment of Psychological Research Services of Western Reserve University is assisting in the planning of this difficult phase of the subject.

In field tests, the tasks would present no problem, and productivity could be readily determined, possibly by methods already in use at the plant.

Time Schedule—It is impossible to obtain any realistic estimate of time requirements for Phase 6, either in the Laboratory or in the field, until the program has been carefully outlined.

If tests are to be made in the Environment Laboratory, they would not be started until after the completion of Phase 5 according to present scheduling. However, field testing could be started just as soon as the program can be properly planned and suitable plants found. With this possibility in mind, Phase 6 is shown running concurrently with other studies on the bar-chart time schedule.

Phase 7—Effect of Environment Conditions on Learning Rate

Introduction—At the present time the educational facilities of this country are badly overcrowded because of the population explosion which has been occurring during the last two decades. At the same time, the entire educational system is being carefully studied to find means of accelerating it and making it more effective. Yet, in spite of the serious building shortage which exists, and the demands for the speeding up of our educational programs, most of our educational facilities, from primary grades through the college level, are used only about nine months of the year.

There are many who believe that at least a part of the solution to this problem may be obtained by the installation of air conditioning in existing and new school buildings. Certainly if the buildings could be made usable twelve months of the year by controlling the thermal environment in them, the building shortage would be relieved. However, the advantage of air conditioning might extend far beyond the mere improvement of the building occupancy factor. By being able to maintain an environment most conducive to study and learning, the general effectiveness of the educational program might be improved.

Facilities—Learning rate, like productivity, could be studied either in the Laboratory or in the field. An air conditioned and an unconditioned school having students of the same age groups and capabilities might provide an ideal setting for the test program. Both types of programs are being considered.

Measurement of Learning Rate—The tasks to be assigned to subjects in a laboratory study do not appear to present as serious a problem as those for the productivity studies. In a field study, the tasks could presumably be the regular study assignments which would be done in the school. However, the tests must be conducted in such a manner, and the data so analyzed, that the results will clearly reflect the effect of the thermal environment on the learning rate of various age groups. Here again, the assistance of competent psychologists is needed.

Time Schedule—On the assumption that field tests will prove feasable, Phase 7 is shown running concurrently with the other studies in Fig. 1.

IN MARCH——

News report upon the Semi-annual Meeting in Chicago with candid pictures of Technical Sessions, Symposiums, Social Events, Welcome Luncheon and Banquet.

President's Page with inaugural message by incoming President R. H. Tull who takes office at the banquet.

Publication in full of two of the Meeting papers and condensed presentation of highlights of one of the Symposiums.

Influence of unshaded window area on selection of *Peripheral Air Conditioning* systems

ALFRED L. JAROS, JR.
Member
ASHRAE

Size, type and direction faced by windows play an important part in determining the amount of cooling needed for a specific area; it is less well known that the ratio of solar radiation entering through windows to total sensible cooling demand governs the relative economy and convenience (and hence the logical choice) of the several air conditioning systems that may be utilized.

To start from a definite basis, consider those values computed for the south peripheral zone of a typical office building. Three sets of examples have been tabulated, differing only in the percentage of glass to total facade and in the types of glazing and shading, if any. The results, which cover a range from the smallest to the largest practical windows, are presented in Tables I, II and III.

ASSUMPTIONS

Outdoor condition, 95 F dry bulb, 75 F wet bulb

Indoor condition, 75 F dry bulb, 50% relative humidity

South exposure, August mid-day*

Occupancy, one person per 100 sq ft (light activity)

Electrical usage, 5½ watt/sq ft

Wall construction, 12 ft floor-to-floor, U = 0.3

Ventilation, 0.4 cfm outside air/sq ft (75 to 64 F wet bulb)

A number of conclusions can be drawn from data included in the tables. The more transparent the glass is to solar radiation and conduction, the greater the saving to be realized by reducing window size. As an example, reducing the ratio of glass from 75 to 25% will, for plain unshaded glass, reduce cfm by 49% and total tonnage by 37%; for completely outside-shaded glass these reductions are 35 and 25%, respectively.

Heat retarding glasses are valuable for exposed windows (15% reduction in cfm; 10% or more reduction in total tonnage); but with efficient shading, their effect is negligible. Double glass, like heat retarding glass, may be worthwhile if it has to be unshaded, but it is of little use in summer if it can be shaded properly. Venetian blinds or their equivalent in drapes will reduce cfm by 20 to 40%, depending on the percentage of glass, and tonnage by 10 to 20%; effective outside shading is preferable, providing 30 to 45% reduction in cfm and 20 to 35% reduction in tonnage in the example studied.

To appreciate the bearing of such comparisons on the type of system to be used, some description of possible systems suitable for peripheral zones, and of the considerations which govern their use, seems advisable. One of the largest variable factors is heat gain due to solar radiation. In a typical office building, the maximum simultaneous cooling demand can be itemized as follows:

People, lights, office equipment	37%
Conduction through walls and roofs	1
Conduction and solar radiation through windows	27
Dehumidification of outdoor air supply	24
Miscellaneous, including heat from fans	11

These figures are for a building whose windows approximate 40% of the facade area, with venetian blinds.

One of the simplest ways to save in the cost of air conditioning, and still have an adequate, efficient and satisfactory plant, is to keep the sunlight entirely out of the windows, or as nearly so as other considerations will permit. This is a common practice in the tropics, probably because it was even more necessary there during the centuries before air conditioning was developed.

Various methods of outside shading compare as follows: old-fashioned canvas awnings, on the outside of the building, could do more to reduce cooling demand than any use of heat-absorbing glass, venetian blinds or other inside shades. Performance of such awnings could be improved further by making them light in color on the outside, and by providing a ventilating slot at the top of each. Light color would reflect more of the sun's rays outward and the ventilating slot would permit hot air to escape from under the awning instead of increasing heat conduction through the window. Modern types of ventilating awnings, of aluminum or plastics, will do as well as canvas awnings.

Unfortunately, all of these suffer from a common defect – they must be manipulated, perhaps at several hundred separate points in a building, and to do this the windows must be opened and closed. Because of this nuisance, such methods have fallen largely into disuse. Substituted usually are inside venetian blinds or reflective,

*(Note: 8:00 am east, 4:00 pm west, or October and November noon south will increase solar input approx 60%.)

Alfred L. Jaros, Jr., is a partner in Jaros, Baum and Bolles, Consulting Engineers. This paper was presented at the ASHRAE New York Chapter meeting held September 27, 1960.

Table I

(Comparisons: All per one-ft width, extending 15 ft deep. Outside zone)

Sensible Load, Btu/hr

Glass in Facade	25%		50%		75%	
Conduction, single glass		61		122		183
double glass	30		61		91	
wall glass	48	48	32	32	16	16
Occupants	35	35	35	35	35	35
Electrical Equipment	280	280	280	280	280	280
Total sensible, excluding solar	393	424	408	469	423	514
Solar, unshaded, plain glass		306		612		918
double glass	276		552		827	
heat retarding glass		(224)		(448)		(672)
Total sensible, including solar	669	730	960	1081	1250	1432
Solar, inside blinds, plain glass		171		342		513
double glass	147		294		440	
heat retarding glass		(168)		(346)		(504)
Total sensible, including solar	540	595	702	814	863	1027
Solar, outside shading, plain glass		84		168		252
Total sensible, including solar		508		637		766

Note: Figures for heat retarding glass have not been included in the "Total sensible" summations.

Table II

Cfm Circulated per sq ft of Floor (All-Air)

Glass in Facade	25%	50%	75%
(Unshaded) plain glass	2.7	4.0	5.3
double glass	2.5	3.6	4.7
heat retarding glass	2.3	3.2	4.4
(Inside Blinds) plain glass	2.2	3.0	3.2
double glass	2.0	2.8	3.0
heat retarding glass	2.2	3.0	3.2
(Outside Shading) plain glass	1.9	2.4	2.9

Note: Above figures are at 25 F temperature-difference, and would vary pro-rata at other temperatures.

Table III

Ton per 1000 sq ft of Peripheral (South)-Zone, Including 32 Btu/sq ft for Latent Heat and Outside Air

Glass in Facade	25%	50%	75%
(Unshaded) plain glass	6.00	7.45	9.65
double glass	5.30	6.95	8.55
heat retarding glass	5.15	6.55	7.70
(Inside Blinds) plain glass	4.95	6.05	8.30
double glass	4.60	5.50	6.35
heat retarding glass	4.75	5.90	6.60
(Outside Shading) plain glass	4.40	5.15	5.85

drapes, which, however, are less efficient than outside shading.

On orientations where the sun is high in the sky (in the northern hemisphere, the south facade, and in the southern hemisphere, the north facade), projecting balconies or cornices could be arranged to do as effective a job as any sort of awning. However, this method of shading is less useful on easterly exposures and almost useless on westerly exposures, because the solar heat radiation is greatest late in the afternoon, as the sun gets low in the sky.

For these directions, the best shading methods are fixed or movable metal or concrete jalousies several feet out from the building (which introduces a problem in supporting them, unless projecting vertical fins are used for this purpose), or various systems of vertical fins, either fixed a little way out from the windows or pivoted so that their angulation can be adjusted to the changing direction of the sun's rays. The latter method is especially valuable on exposures somewhat to the south of true east or west; the diagonal spaces between such louvres should then face north rather than south.

Each building, and to some extent each different facade (depending on its orientations), deserves special study for the best results; in different cases, various combinations of these methods work most efficiently.

AIR DISTRIBUTION METHODS

While a detailed discussion of air conditioning systems is outside the scope of this paper, it is necessary to point out that nearly all buildings require zoning; they must have systems so arranged that the amount of heating or cooling effect can be controlled independently in the several (differently oriented) peripheral zones, separately from the interior zone. The need to do this, and as economically as possible, has largely dictated the development of the various systems here discussed.

Subdivided conventional systems — Sometimes used for new buildings but more applicable to old ones; subdivision of conventional systems (each servicing one floor or, at most, two or three floors) into several separate zones, selected as to exposure to sunshine, wind and other factors.

Peripheral systems — Peripheral zones (areas extending about fifteen ft inward from the windows) are cooled or heated by means of compact local units, located in metal cabinets under windows or in a continuous metal sill construction.

Least expensive to install, under each of three stated ratios of window area to building facade, is the single-duct (all-air) system, although this is cited as being the least effective of the five systems considered.

Of the other four, the least expensive when vertical distribution is feasible, are those with peripheral units, with induction systems noted as being more economical than fan coil units.

The radiant ceiling system, more costly in buildings with large window expanses, becomes the least costly when window area is less than 25% of the building facade.

Each unit circulates locally as much conditioned air as will serve the zone space bounded by one window; inner zones of the building are conditioned by separate ducted air supply systems.

In one widely used method, units under windows receive primary air (about 25% of the total to be circulated in the room) from a remote fan room, through small high velocity conduit ducts usually run vertically near each outside wall column. The primary air is filtered, cooled and dehumidified (or heated in winter) as necessary and delivered under considerable pressure to the acoustically-baffled under-window units where, by means of ejector nozzles, it induces several times its own volume of air from the room into the unit, mixes with it and delivers the mixture back into the room. Aspirated room air passes through a finned coil in the unit, is cooled or heated by water circulated from a piping system connected to each unit and then distributed.

Another somewhat similar method uses small motor-driven fans in the units to handle recirculated room air, while primary air either may enter the unit at lower pressure for mixing or is delivered to the room through separate outlets.

Double-duct systems — A single central high pressure system utilizes two supply ducts, with air at two different temperatures (one quite low, the other moderately high). Mixing-dampers, thermostatically controlled, deliver air at the correct temperature to the control box supplying the outlets for each individual zone or room. This system provides excellent control and is applied to mixing boxes under windows, usually, for peripheral zones. Larger ducts and fan room equipment are required than for peripheral systems, but water piping distribution is eliminated.

Radiant heating and cooling — Heated or cooled water is circulated through coils which extract heat from an aluminum ceiling exposed to the room to be thus air conditioned. To absorb heat, the ceiling must be appreciably colder than the air or other surfaces in the room. For example, a suitable surface, about 15 F cooler than the room air, will absorb 20 to 25 Btu/hr/sq ft of sensible heat. This is approximately the differential between typical inside and outside zone demands, if glass area is less than 25% of the facade or else windows are well shaded. Such a system permits considerable reduction in the amount of conditioned air required and often makes it possible to combine outside and inside zones into a single system of fans and ducts, supplemented by small convectors or radiant panels under windows (for winter use only), with room and zone control obtained entirely by means of the water supplied to the radiant ceiling.

Table IV

Installation Costs

Per net 1000 sq ft; glass area 25%	Double Duct	Radiant Ceiling	Fan-Coil Units	Induction Units	Single Duct
Heating, ventilating, air conditioning equipment	$4300	$4300	$4000	$4350	$3250
Electricity, plumbing, miscellaneous	1000	600	1350	700	1050
Total cost	$5300	$4900	$5350	$5050	$4300
Ton refrigeration	4.3	4.0	4.0	4.0	4.3
Ducted cfm (S & R)	4500	1700	600	650	3400
Supply cfm/ton	680	240	100	115	420
Total cost per ton	$1235	$1225	$1338	$1262	$1000
Glass area 50%					
Heating, ventilating, air conditioning equipment	$5100	$5100	$4200	$4550	$3700
Electricity, plumbing, miscellaneous	1200	700	1400	800	1200
Total cost	$6300	$5800	$5600	$5350	$4900
Ton refrigeration	5.7	5.2	5.2	5.2	5.7
Ducted cfm (S & R)	6000	3000	600	1000	4500
Supply cfm/ton	700	320	77	120	435
Total cost per ton	$1100	$1110	$1075	$1025	$ 865
Glass area 75%					
Heating, ventilating, air conditioning equipment	$5900	$5500	$4900	$5000	$4250
Electricity, plumbing, miscellaneous	1400	900	1500	900	1350
Total cost	$7300	$6400	$6100	$5900	$5600
Ton refrigeration	7.4	6.8	6.8	6.8	7.4
Ducted cfm (S & R)	7600	3800	600	1250	5700
Supply cfm/ton	690	300	59	114	430
Total cost per ton	$ 985	$ 940	$ 900	$ 870	$ 760

Note A Double-duct cfm includes 100% cold deck and 60% hot deck. Note B Radiant ceiling costs have been credited with value of standard acoustic ceiling. Note C It must be understood that these figures will vary with each proportion and orientation of buildings, as well as with locality and quality; they should be considered comparative only.

INSTALLATION COSTS

Installation and operating costs of air conditioning buildings of the multi-story type, a major factor in design selection, fall under three main heads.

Included in the central refrigerating plant are refrigerating machines and accessories; cooling towers or other sources of condensing effect; condensing and chilled water piping and pumps; steam, drain and fresh water connections; thermal insulation and acoustic and vibration protection. Cost of this may vary between $400 and $550 per ton, including piping, depending on location and type of plant.

Floor work or distribution systems are comprised of fans and drives, cooling and heating coils and connections, ducts, filters, units or outlets, automatic controls, exhaust ventilation, pipe connections, thermal and acoustic insulation.

Other trades cover electric power supply and wiring for the central plant, foundations, supports for cooling towers and similar considerations.

The first and last of these three items lie outside the scope of this paper; both installation and operating costs for a given type of central plant will vary in proportion to ton of refrigeration (Table III).

For a multi-story office building, under typical metropolitan conditions, an attempt has been

CONCRETE SLAB CONSTRUCTON HAS THERMAL ADVANTAGES OVER WOOD FLOORING PAGE 57

made to analyze the cost of installation for five distributor systems (Table IV), as affected by relative proportion of sensible heat load from windows. Considered are a double-duct (all-air) system, with mixing boxes under windows for peripheral zones, plus a single-duct system for inside zones; metal radiant ceilings for cooling and heating peripheral zones, with a single-duct system for all parts of the floor; fan coil-type units under windows for peripheral zones and a single-duct system for interior zones; induction-type units under windows for peripheral zones and a single-duct system for interior zones; and single-duct (all-air) systems separately zoned for interior and exterior, with heating convectors under windows. Such systems as the last may involve fan rooms on each floor, especially in alterations of existing buildings.

Data in Table IV are based upon a 30-story building, approximately 300 x 80 ft in plan (principal exposures north and south); peripheral zone areas amounted to nearly 10,000 sq ft net per floor. Cost estimates were calculated in unit costs and capacities for each 1000 sq ft of peripheral zone area.

Outside air brought in for ventilation was taken at 0.4 cfm/sq ft; outside conditions at 95 F dry bulb and 75 F wet bulb, inside at 75 F and 50% relative humidity. Under these conditions the interior zone net area was approx 8000 sq ft per floor (not including core) and its separate air handling system (1.0 cfm total air per sq ft) came to $1500 for heating, ventilating and air conditioning and $400 for plumbing, electricity and miscellaneous, per 1000 sq ft. None of the figures tabulated includes the central refrigerating plant, whose cost will be independent of the type of air handling system. All costs were based on efficient design for the type of system, good materials and proper installation, as well as use of ample insulation, acoustic treatment and sufficient automatic controls (the one exception being the single-duct system, which includes only control for whole zones, not for individual rooms or bays).

Physical conditions — Costs tabulated are based on vertical distribution of secondary water and primary air for induction or fan coil units in high buildings. With some building layouts, large windows may make this physically impossible. Horizontal distribution in every ceiling outward from the core will be necessary then, with an extensive increase in the quantity and cost of sheet-metal work and piping, enough to increase the total cost of the peripheral system (not including the central refrigerating plant) by 10, 20 and, in some cases, 30%.

Similar considerations apply to double-duct systems with mixing boxes under windows. With quite large windows, horizontal duct distribution may be necessary in every ceiling; with small windows, it might have been every third or fourth ceiling. The result again will be an increase in sheet-metal cost.

Radiant ceiling cooling is not the answer with large windows. With 25% or smaller window area, the ceiling can take care of the maximum load due to glass and walls; with 75% window area, it can care for only a third or less of this load. A separate large zoned peripheral air system must still be provided to supplement the ceiling, and horizontal distribution in every ceiling will raise the sheet-metal cost.

WHO'S WHO IN ASHRAE

Insofar as possible these listings will each appear twice a year

ASHRAE OFFICERS, DIRECTORS COMMITTEES, STAFF
See page 88, December JOURNAL

REGION AND CHAPTER OFFICERS
See page 82, November JOURNAL

RESEARCH AND TECHNICAL COMMITTEES
See page 67, September JOURNAL

STANDARDS PROJECTS
See page 74, this issue

INTER SOCIETY COMMITTEES
See page 84, November JOURNAL

CONCLUSIONS

Consideration of Table IV brings out several points. As might be expected, the single-duct system (the least effective and controlled) is the most inexpensive to install with each proportion of window area, a factor which may be offset, in practice, by heavy demand for duct and equipment spaces.

Of the other four systems, the least expensive when vertical distribution is feasible are those with peripheral units, when window areas are materially in excess of 25%. Induction unit systems are usually a little more economical overall than fan coil units, chiefly because of heavy wiring and plumbing (drainage) costs of the latter.

The radiant ceiling system, which is distinctly more costly with large windows, becomes the least costly system when window area is less than 25%. This is because the relatively high cost of the ceiling panels is then more than offset by the small capacity and simplicity of the air handling system which supplements it and which, in this case, need carry only the same loads as an interior zone system.

With large windows, double-duct systems are usually the most costly. Due to rapid shrinkage of air quantities, ducts and fan sizes, they become competitive when window area is approximately 25%, and, for still smaller window area than this, have proven even less costly than an induction system, especially in warm climates where the same ceiling-duct system can serve both interior and peripheral zones.

Comparisons based on inside venetian blinds actually relate to room sensible load, not glass area alone. If use of effective outside shading reduces the latter to as great an extent with larger windows as with venetian blinds and small windows, similar results would follow. In a tropical city with more than 100 F design temperature and high humidity, radiant ceilings have proven less expensive than peripheral units, in a building with excellent outside shading for 55% window area. In comparison, peripheral units most often prove the least costly under conditions such as in New York City.

Past-President

Charles Stein Leopold

1896-1960

Fellow of the American Society of Heating, Refrigerating and Air Conditioning Engineers, past-President of precedent American Society of Refrigerating Engineers and 1954 recipient of the F. Paul Anderson Award, Consulting Engineer Charles Stein Leopold died in Philadelphia, Pa., on November 24, 1960, following a heart attack.

As founder (in 1923) and head of the firm which bears his name, Mr. Leopold was noted for his achievements in the fields of heating, air conditioning and ventilating, and was the designer of systems for such projects as the Pentagon Building, U.S. Capitol, New York Stock Exchange, Philadelphia's Convention Hall, Madison Square Garden and research laboratories for the U.S. Atomic Energy Commission at Los Alamos, N. M., and Ames, Iowa. In addition, he developed a method of controlled air supply for testing carburetors of airplanes during World War II.

Co-author of a study on air filtration for relief of asthma and hay fever patients, his technical papers delivered at Annual and Semiannual Meetings of the Society included discussions of smoke measurement, importance of radiation in air conditioning design, comfort conditions, panel cooling and problems of thermal storage, radiation, convection and conduction. Articles by him have appeared in the Journal of the American Medical Association; Heating, Piping and Air Conditioning; and Refrigerating Engineering, among others.

Born May 8, 1896, in Philadelphia, he was the son of Isaac and Sarah (Stein) Leopold. Educated at local Philadelphia schools, he later attended the University of Pennsylvania, where he received the degrees of B.S. in electrical engineering in 1917 and E.E. in 1947. During the first World War, Mr. Leopold served as an Ensign in the U.S. Naval Reserve. In 1920 he married Marian Rose Bettmann, who survives him.

Active in the former ASHAE and precedent ASHVE since his election to membership in 1934, he has served as a member of Council and the Committee on Research, Chairman of the Guide Publication Committee and a member of the TACs on Treatment of Disease, Cooling Load in Summer Air Conditioning, Radiation and Comfort, Physiological Reactions and Sensations of Comfort (Chairman).

Prominent in ASRE activities, he was Chairman of the Committee on Relations With Other Organizations, Representative to the International Joint Committee on Psychrometric Data, Director from 1941 to 1943, Vice President in 1944-45 and President and Chairman of the Executive Committee in 1946.

Mr. Leopold was a Fellow of the Royal Society of Arts and, in 1955, was awarded the Frank P. Brown Medal by Franklin Institute "in consideration of his outstanding contributions to air conditioning, particularly in the research and development of air conditioning techniques and the application of air conditioning to a wide variety of important structures." That same year he was cited by the Schools of Engineering of the University of Pennsylvania for "his distinguished career as an engineer." At the 1955 Annual Meeting of ASHAE, he was presented with the F. Paul Anderson Medal for 1954, the Society's highest honor, given in recognition of his outstanding contributions to the advancement of human comfort in the fields of heating, ventilating and air conditioning.

Snow Melting Problems

and how they were solved

Snow removal is a problem for public works, industrial plants, retail stores, hotels and other public service organizations. Snow removal must be done promptly and completely to eliminate public hazards, loss of production or loss of trade. How has the installation of mechanically heated, circulating fluid systems for snow melting answered this problem?

During the past twelve years, numerous snow melting piping systems have been installed for various types of applications. A review of the principal features of design and the actual operational performance of some of these systems forms a guide for future applications. This paper covers three installations in Massachusetts. With adjustments for different weather conditions, similar results should be expected in other areas.

The Massachusetts Department of Public Works approved in 1950 the installation of snow melting piping systems in fourteen ramps leading to and from the elevated Boston Artery. These ramps were within the area that is served by the Boston Edison District Steam System. The average length of ramps is about 700 x 28 ft. The lower section of each ramp is built on fill, contained within retaining wall for a distance of about 300 ft from the intersection with the lower street level. Snow melting systems are limited to that part of the ramp constructed on fill. The snow melting area of the fourteen ramps total about 110,000 sq ft.

At the time that this project was designed, published data suggested that an adequate system should provide capacity to melt an average of one inch of snow per hour. To accomplish this capacity, the data further suggested that a total input of 120 Btu per sq ft of slab and a coil spacing of 1¼ in. pipe at 18 in. on centers, or 1-in. pipe at 15 in. on centers would be adequate.

F. J. TURNBULL

Member
ASHRAE

However, observations of the performance of systems then in operation indicated that the current criteria were not adequate for highway systems. Accordingly, the grid design selected was 1-in. wrought iron pipe at 12-in. on centers with 2½-in. headers. Grids are the full width of the roadway. The cover over the coils is 2½ in. of concrete plus 2½ in. of black top.

The heat output of the convertors and parallel operation of pumping units provide up to 300 Btu per sq ft of heated paving with a fluid temperature of 160 F. The fourteen ramps are served from five convertor pump houses with a total of three service connections to the district steam system. The antifreeze fluid is an ethylene glycol solution.

Automatic control of the heated slab temperature is provided by means of thermocouples in the slab. Steam to the convertors is also controlled by the fluid outlet temperature. The slab temperature control has not been used. The Weather Bureau makes special forecasts to the Highway Department of probable snowfall.

If the weather has been cold, the systems are started 6 to 8 hr before snow is expected; if the temperature has been in the upper 20's, two to three hours before the expected snowfall has been found to be sufficient. The stations are also operated intermittently between storms. The five pumping stations are operated and maintained by one man on a part-time basis.

The schedule of operation has maintained a quite satisfactory performance, with no slush or ice accumulating on the heated areas. The bare pavement at the lower end of the entrance ramp permits safe acceleration and on the exit ramps permits non-skid braking where vehicles must stop before entering converging traffic.

The annual number of operating hours of the snow melting system was not available. The following operating data were obtained

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Foremost among "difficult" areas for traffic maintenance during conditions of snow, sleet and freezing rain is the shore zone of New England.

Here is an authoritative reference to specific conditions encountered and to successful combative methods and systems adopted.

F. J. Turnbull is Senior Mechanical Engineer with Fay, Spofford & Thorndike, Inc. He similarly addressed the Region I Meeting in Boston in October.

from Boston Edison District Steam Div:

Year	Total Snowfall in.	Annual Steam Consumption M-lb	Lb Steam Per In. Snowfall Per Sq Ft	Lb Steam Per Sq Ft Per Yr
1956	72	13,207	1.68	120
1957	36	7,355	1.85	65
1958	49	7,728	1.43	70
Normal	Average Annual Snowfall—42 in.			

Note: The above report from Boston Edison District Steam System includes the comment that a large sidewalk system (24,660 sq ft), served by Edison steam, operates consistently at an annual rate of 1.05 lb of steam per in. of snowfall per sq ft of melting area.

AT AN AIRPORT

A typical sidewalk snow melting system is installed in the walkways to the entrances and exits of the Terminal Building at the Municipal Airport, Worcester, Mass. The total heated area is about 4,000 sq ft. The coils are serpentine with 1¼-in. pipe 20 in. on center and 2-in. concrete cover. The anti-freeze fluid is light heat transfer oil with a design flow temperature of 165 F. The heat input to the slab is about 300 Btu per sq ft of heated area. On account of the use of oil, the heat exchangers and valves are of ferrous construction.

This system is operated manually similar to the operation of the Boston Central Artery. The length of the warm-up period is determined by the judgment of the operator. The normal operating fluid temperature is 150 F.

Steam for the system is supplied by the building heating plant and is not separately metered. The record of the operating hours are as follows:

Season	Total Snowfall in.	Operating Time hr
1956-1957	65.6	600
1957-1958	97.5	1,100
1958-1959	64.5	503
1959-1960	66.5	1,100

The operating time during the 1959-1960 season is considerably higher in proportion to the actual snowfall because a number of forecasted storms bypassed the Worcester area.

Another type of application that is being considered as a standard requirement is snow melting for the door tracks of hangar doors. The construction of a double cantilever hangar for flight test facilities, at Hamscom Air Base, Bedford, Mass., was completed during 1959. Each hangar section is 180 x 100 ft deep with continuous doors on two sides of each area. The snow melting panels for the doors are generally five ft wide with a total heated area of 3,200 sq ft.

On account of the type of occupancy, the operation of the hangar doors during a storm is not considered critical and 230 Btu was determined as the slab output requirement. The equipment and piping is designed for a total input of 320 Btu per sq ft of heated slab with a flow temperature of 160 F. The anti-freeze solution is ethylene glycol solution.

The depth and length of door track rails required a 6-in. concrete cover over the pipe coils. To offset this depth of cover, the coils consist of serpentine panels with 1-in. pipes laid 6 in. on center. The panels are 60 to 80 ft long. The cost of the complete system was $6.50 per sq ft of heated surface.

During the 1959-1960 season, this system has been operated continuously when the outside temperature is below 32 F. Considering that at least one half of the heated area is inside the hangar with the doors closed, the radiant effect helps to prevent cold drafts near the large doors. The operating flow temperature has been controlled at 140 F, which is 20 F below the design flow temperature with no accumulation of snow or ice. As the steam supply is from the building heating boilers, operating costs are not available. The steam demand for snow melting is about 10 per cent of the building heating demand.

These three installations represent different types of applications. In each case the overall operational performance has been notably satisfactory. Unfortunately, complete operational data and maintenance costs are not available for comparison with conventional snow removal methods. It is definite that mechanically heated circulating systems do have a wide field of application to solve the snow removal problem.

THERMAL EFFECTS

(*Continued from page* 61)

months. However, December may not be the low point. It probably occurs in January or February more nearly evening out the gain and loss periods.

In December for the first time, the sub-slab temperature is substantially higher than the outdoor air temperature during the entire 24-hr period. Heat flows upward from the ground through the slab into the air of the cubicle from 6:30 p.m. until 9:00 a.m. As in September sub-floor temperatures of the wood floor (Fig. 8) are about the same as the outside air temperature during the early part of the day and higher during the latter part of the day.

The curves representing the top surfaces of concrete and wood floors, respectively, bear some resemblance to their counterparts in September, except that the wood floor top surface in December is only slightly warmer than the concrete floor top surface during the early afternoon hours, whereas the concrete floor surface is a good deal warmer than the wood floor surface during the rest of the day. This change presumably has been brought about by the relatively warmer concrete sub-floor which initiates heat transfer upward through the slab.

The relationship of interior air temperature curves, concrete to wood, is much like that noted in March and something like that in September but with a smaller difference. The mid-day concrete floor cubicle is cooler by a smaller margin than the wood floor cubicle than is the case in September.

At night in December and in March the outside air clusters with the wood curves (sub-floor, floor, and room air). During June and September the three wood curves remain together, but the temperature of the outside air which is in contact with the crawl space air, is a little lower than the cluster of wood floor cubicle curves, indicating a more rapid transfer from the floor through the crawl space to the outside air than in December and March.

In summary, because the only difference between the two cubicles lies in the floor construction, the annual behavior of the sub-floor temperatures stimulates the differences in interior air tempera-

ture patterns. There are smaller differences and flatter curves for the concrete floor cubicle and greater differences and steeper curves for the wood floor cubicle. The concrete sub-floor varies from a minimum of about 55 F at 10:30 a.m. in December to a maximum of about 92 F at about 7:00 p.m. in September. The wood sub-floor varies from a minimum of 40 F at 8:00 a.m. in December (and is undoubtedly lower on colder days) to a maximum of 91 F at 3:30 p.m. in September. The wood floor has a six-month cycle of warming and cooling. The concrete floor has probably an eight-month cycle of warming and a four-month cycle of cooling.

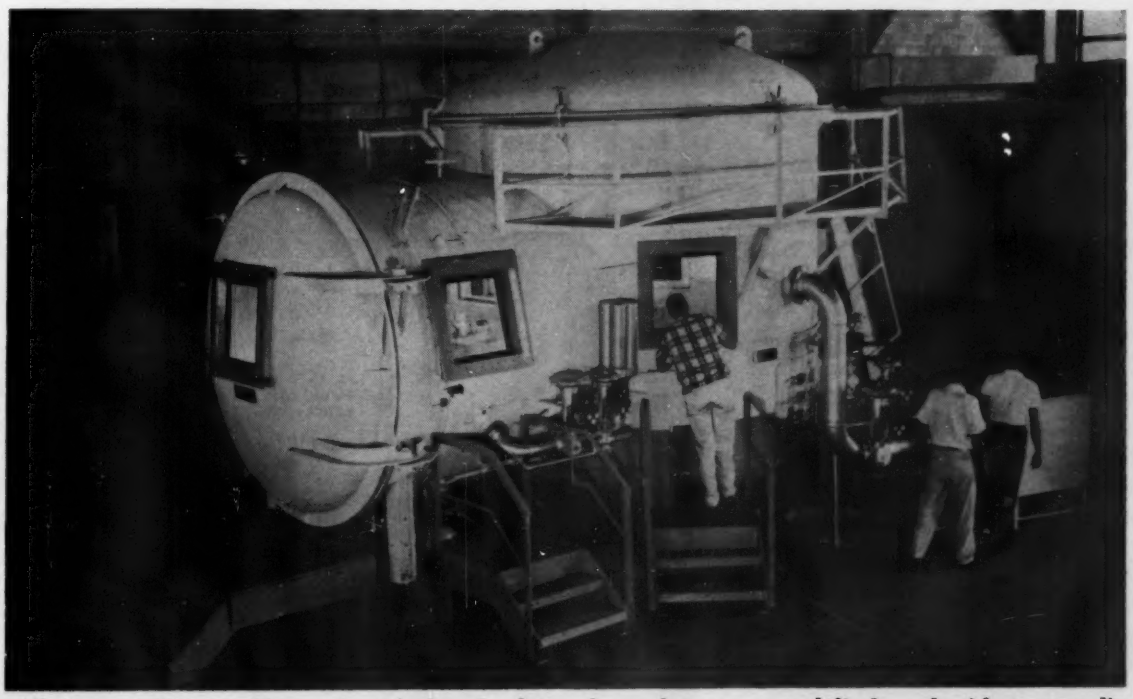
As a result, in March and again in June interior air temperatures in the concrete floor cubicle are 5 or 6 F warmer than those in the wood floor cubicle during the early hrs of the morning. This difference is increased to about 12 F in September and then decreased to about 8 F in December. During the middle of the day, March air temperatures inside the wood cubicle are about 5 F warmer than those in the concrete cubicle, in June 3 F warmer, in September about 10 F, and in December about 5 F.

For purposes of evaluation, then, it can be said that concrete slabs have the advantage of being cooler during the hot part of the day. On the other hand, the concrete slab is warmer at night. A warm floor is clearly an advantage in December with its cold nighttime temperatures, colder than those comfortable inside inhabited structures. The same can be said of the spring when nocturnal temperatures are too cold for comfort in the wood floor construction. During the summer, in both June and in September, the wood floor cubicle has an advantage at night, but its advantage during this season could be virtually eliminated by generous nocturnal ventilation.

All in all, it can be said that in the climate in which these experiments are being conducted there are thermal advantages to concrete slab construction over wood floor construction.

The objection may be raised that the crawl space under the wood floor was lower than that normally encountered; that it was not enclosed around its periphery; that ventilation exceeded that which is encountered in a normally ventilated crawl space; and that it is therefore probable that the differences encountered between slab and wood floor construction would be somewhat reduced, if standard house construction had been used instead of the experimental construction of the crawl space involved. However, the height of the air space and the degree of ventilation tend to counteract each other, so probably the difference would not be significant.

Altitude Simulator for Space Men



Installation of Project Mercury's high altitude simulator at Cape Canaveral, Fla., gets U.S. astronauts accustomed to living in space. The "rise" is to an altitude of 225,000 ft, roughly 45 miles.

In its main, kettle-like section, 12 ft diam and 15 ft high, the simulator will accommodate the capsule in which the first American space man is expected to soar into orbit.

The capsule and its passenger are lowered into the main chamber of the simulator, here shown as National Aeronautics and Space Administration inspectors checked it out at the huge rocket-launching site following construction by Tenney Engineering Inc. The left section is an ante-room for observers which can be used, if desired, as a safety lock.

When inside the capsule, on his back and with his knees drawn up toward his chest in takeoff position, the astronaut is cut off from the world except for a man-made umbilical cord with oxygen lines, an intercom system and a variety of test control signal conductors. The astronaut's reactions in the simulated void can be viewed by doctors and others through windows and ports in the high altitude chamber.

The simulator's vacuum system will provide dive rates of up to 50,000 fpm; but, in an emergency, the chamber will be able to reach sea level from 225,000 ft in six sec.

ASHRAE STANDARDS PROJECTS

STANDARD No. — PROJECT COMMITTEES FOR PROPOSED REVISIONS

16-56R — **Method of Testing for Rating Room Air Conditioners**

Chairman: R. H. Meyerhans	*Members:* C. G. Coyne	E. Gmoser	E. H. Schwenker
Liaison: J. R. Schreiner	K. D. Crook	P. E. Kolb	E. C. Tanner
	R. W. Gilmer	J. R. Schreiner	

17-48R — **Methods of Testing for Rating Thermostatic and Constant Pressure Refrigerant Expansion Valves (ASA B60.1-1950)**

Chairman: D. C. Albright	*Members:* F. Y. Carter	*Alternates:*
Liaison: T. B. Simon	K. E. Wilson	W. Stafford
	W. F. Wischmeyer	D. S. Sterner

18-56R — **Methods of Testing for Rating Self Contained Mechanically-Refrigerated Drinking-Water Coolers**

Chairman: W. Taylor	*Members:* F. O. Graham	F. J. Reed	E. W. Scott
Liaison: T. B. Simon	P. R. Lynn		

22-48R — **Method of Testing for Rating Water-Cooled Refrigerant Condensers**

Chairman: L. R. Smith	*Members:* P. K. Barker	C. E. Drake	W. O. Kline
Liaison: A. S. Decker	J. G. Bergdoll	R. L. Jones	

24-57R — **Methods of Testing for Rating Liquid Coolers**

Chairman: R. L. Jones	*Members:* P. K. Barker	J. D. Bergdoll	L. R. Smith
Liaison: A. S. Decker			
Secretary: R. A. Mayer			

53-34R — **Method of Testing for Rating Steam Unit Ventilators**

Chairman: J. W. McElgin	*Members:* L. A. Cherry	D. H. Krans	L. G. Miller
Liaison: K. O. Schlentner	A. F. Hubbard		

PROJECT COMMITTEES FOR PROPOSED STANDARDS

31P — **Method of Testing for Rating Solenoid Valves for Refrigeration and Air Conditioning Systems**

Chairman: J. A. Schenk	*Members:* D. C. Albright	D. S. Sterner	*Alternates:*
Liaison: J. Klassen	F. Y. Carter	W. F. Wischmeyer	J. M. Strauss
	C. C. Hansen, III		K. E. Wilson

36P — **Methods of Equipment Sound Testing**

Chairman: C. M. Ashley	*Members:* W. E. Blazier	A. F. Hubbard	S. P. Soling
Liaison: S. P. Soling	J. B. Chaddock	D. H. Krans	
Consultant: R. J. Wells	J. B. Graham		
Secretary: W. R. Kerka			

39P — **Methods of Testing for Rating Unitary Heat Pumps for Air Conditioning**

Chairman: G. L. Biehn	*Members:* C. H. Belt	R. C. Lower	W. A. Spofford
Liaison: J. R. Schreiner	H. W. Jobes	R. G. McCready	
Secretary: R. N. Mahendra			

40P — **Methods of Testing for Rating Heat-operated Unitary Air Conditioners**

Chairman: J. G. Reid, Jr.	*Members:* D. E. Heath	B. A. Phillips	F. J. Reed
Liaison: J. R. Schreiner	R. H. Merrick		

41P — **Standard Measurements**

Chairman: C. W. Phillips	*Members:* F. J. Reed	W. A. Spofford	G. Thompson
Liaison: F. J. Reed			

51P — **Testing Air Moving Devices (AMCA Standard)**

Chairman: S. Konzo	*Members:* L. G. Seigel	G. L. Tuve	D. D. Wile
Liaison: H. T. Gilkey			

52P — **Standard for Evaluation of Air Cleaning Devices for General Ventilation and Air Conditioning**

Chairman: P. R. Achenbach	*Members:* W. C. L. Hemeon	R. F. Logsdon	P. E. McNall
Liaison: H. T. Gilkey			

54P — **Method of Testing for Rating Gravity Roof Ventilators**

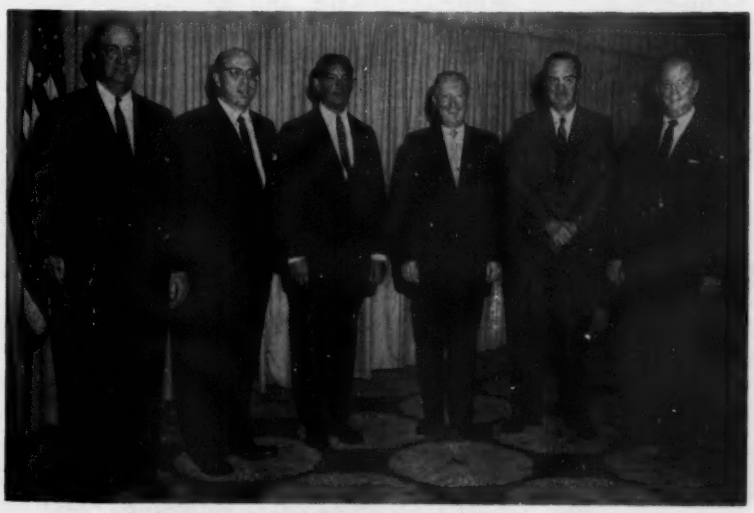
Chairman: R. G. Nevins	*Members:* G. C. Breidert	W. V. Hukill	F. B. Rowley
Liaison: J. Klassen	F. N. Calhoon	J. P. Johnson	L. J. Shumaker
	R. B. Engdahl	K. E. Robinson	

Presently Available Standards

Copies of the following standards may be obtained from the ASHRAE Sales Department at the listed prices. A complete set of all standards is available at $10.

#12-58	Refrigeration Terms and Definitions (ASA B53-1958)	$1.25
#13-58	Home Freezers, Methods of Rating and Testing (ASA B38.3-1955)	.75
	Household Refrigerators, Method of Computing Food Storage Volume and Shelf Area of Automatic (ASA B38.1-1955)	.35
	Household Electric Refrigerators (Mechanically Operated) Test Procedures (ASA B38.2-1956)	.75
#14-59	Condensing Units, Mechanical, Methods of Testing for Rating	1.00
#15-58	Safety Code for Mechanical Refrigeration (ASA B9.1-1958)	1.00
#17-48	Expansion Valves, Refrigerant, Methods of Rating and Testing (ASA B60.1-1950)	1.00
#18-56	Drinking Water Coolers, Self-Contained Mechanically-Refrigerated, Methods of Rating and Testing	.75
#20-60	Methods of Testing for Rating Remote Mechanical-Draft Air-Cooled Evaporative Condensers	.75
#22-48	Water-Cooled Refrigerant Condensers, Methods of Rating and Testing	.75
#23-59	Compressors, Refrigerant, Methods of Testing for Rating	1.00
#24-57	Liquid Coolers, Methods of Rating and Testing	.75
#25-56	Air Coolers for Refrigeration, Methods of Rating	1.00
#26-56	Mechanical Refrigeration Installations on Shipboard, Recommended Practice for (ASA B59.1-1958)	1.25
#28-57	Capillary Tubes, Method for Testing	.50
#29-56	Ice Makers, Methods of Rating and Testing	.75
#30-60	Liquid Chilling Packages, Methods of Testing for Rating	.50
#32-57	Bottled Beverage Coolers, Methods of Rating and Testing	.75
#33-58	Air-Cooling and Air-Heating Coils, Forced Circulation, Methods of Testing and Rating	1.00
#34-57	Refrigerants, Number Designation of (ASA B79.1-1960)	.75
#35A-56	Desiccants for Refrigerant Drying, Method of Testing	.75
#35B-56	Driers, High Side Liquid-Line, Methods of Rating and Testing	1.00
#37-60	Methods of Testing for Rating Unitary Air Conditioning Equipment	1.00
#38-57	Cooling Towers, Mechanical Draft, Methods of Testing for Rating under Controlled Conditions	.75
#45-55	Heavy Duty Furnaces and Direct-Fired Unit Heaters, Code for Testing and Rating	.50
#47-60	Method of Testing and Rating Return-Line, Low-Vacuum Heating Pumps	.50

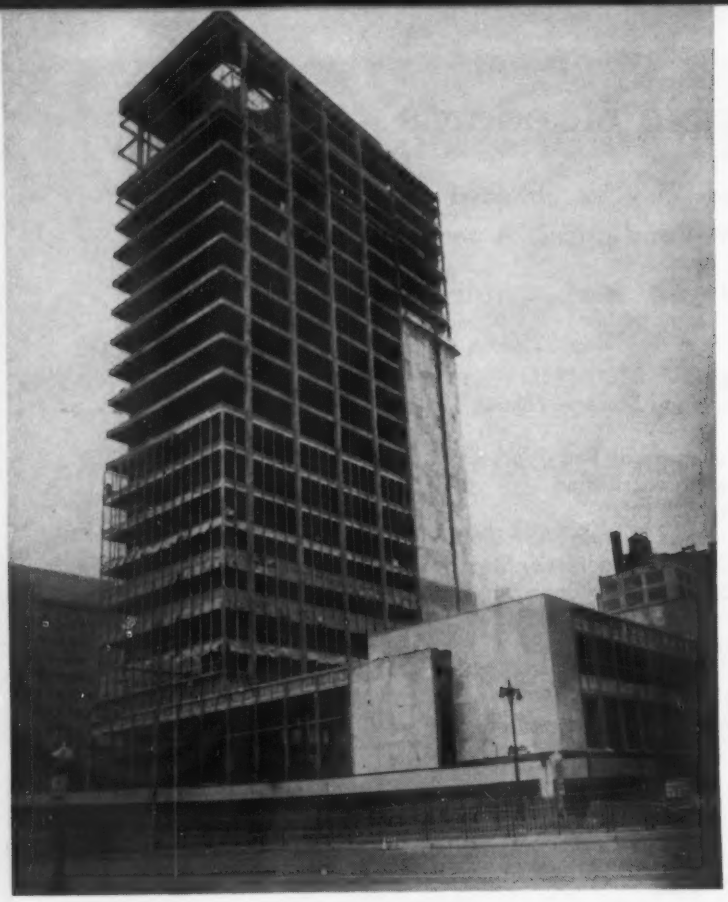
ARI Plans Its Tomorrows



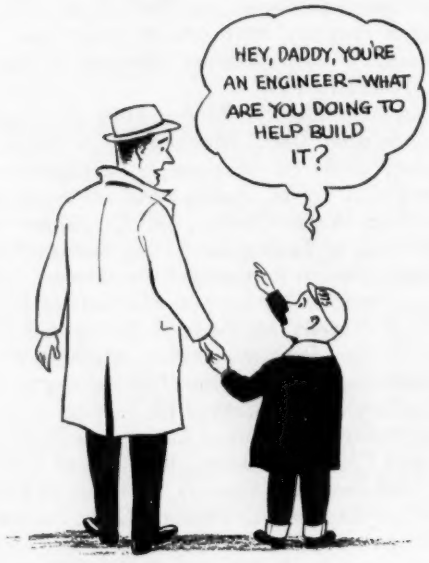
ARI officers here shown are: W. H. Aubrey, President, Frick Company, re-elected Treasurer of ARI; F. J. Kreisal, President, Detroit Controls Div., American Radiator and Standard Sanitary Corp., newly-elected Vice-President; R. K. Serfass, Div. Manager, Westinghouse Electric Corp., Air Conditioning Div., now President; Rudy Berg, Vice-President, Copeland Refrigeration Corp., immediate Past President; L. N. Hunter, Director of Engineering, Crane Co., Plumbing, Heating and Air Conditioning Group, Vice-President and Russell Gray, President, Carrier Air Conditioning Co., Vice President.

Promising "Continued relentless emphasis on standards which represent the industry consensus on product designs of acceptable quality and on certification to assure achievement of quality design," incoming President R. K. Serfass of the Air Conditioning and Refrigeration Institute told, at the ARI Annual Meeting in Hollywood Beach, Fla., of projected plans to assure further accomplishment.

Also to be pursued as administrative objectives, President Serfass cited encouragement of sections in their various projects, growth in membership, greater emphasis on refrigeration activities and development of trained installation and service personnel. Behind these objectives lies the primary goal of a more profitable industry to which greater income and lower costs will be contributory elements. Also well in the forefront were plans for the 1962 West Coast ARI Show to be held February 12-15.



ASHRAE-UEC Contributions Move Slowly



Let us hope that, like the legendary tortoise, ASHRAE will move steadily along and meet its goal. At this date, however, our target of $250,000 still seems a long way in the future. As of December 2nd, only $28,194.90 has been raised. We have $221,805.10 to go.

ON THE BRIGHT SIDE . . . there are now 30 Chapters which are waging active campaigns to raise their assigned quotas. A few weeks ago, there were less than a dozen such. These 30 chapters, now fighting to reach their goals, are:

REGION I—New York, North Jersey, Northeastern New York, Northern Connecticut and Rochester.
REGION II—Manitoba, Northern Alberta, Ottawa Valley and Ontario.
REGION III—Johnstown, Philadelphia.
REGION IV—Savannah, South Carolina. (South Piedmont has already exceeded its quota.)
REGION V—Cleveland, Columbus, Toledo, Cincinnati, Dayton and Evansville.
REGION VI—Iowa, Minnesota.
REGION VII—New Orleans, Mobile, North Alabama and Memphis.
REGION VIII—Northeastern Oklahoma. (Central Oklahoma has exceeded its quota.)
REGION X—Central Arizona, Golden Gate, Southern California and Tucson.

IS YOUR CHAPTER AMONG THOSE LISTED?

WHAT ARE YOU DOING TO HELP BUILD THE UNITED ENGINEERING CENTER?

NAME .....

ADDRESS .....

IN CONSIDERATION OF THE GIFTS OF OTHERS INTENDS TO GIVE TO

UNITED ENGINEERING CENTER BUILDING FUND

.....DOLLARS $.....

BALANCE TO BE PAID QUARTERLY $....., SEMIANNUALLY $.....

ANNUALLY $..... OR AS FOLLOWS .....

SIGNED.....

MEMBER ASHRAE

CHECK MAY BE MADE PAYABLE TO UNITED ENGINEERING TRUSTEES, INC.
29 WEST 39TH STREET, NEW YORK 18, N. Y.
GIFTS ARE DEDUCTIBLE FOR INCOME TAX PURPOSES

For 1961, let's reaffirm our pride in our profession by supporting financially this tangible symbol of the progress of engineering. Send in your contribution NOW!

New Standards Available

A. T. BOGGS, III
ASHRAE Technical Secretary

The following revisions to existing standards or new standards are available from headquarters and effective as of December 12, 1960:

Std. 20-60—Methods of Testing for Rating Remote Mechanical-Draft Air-Cooled Evaporative Condensers – 75c per copy

Std. 37-60—Methods of Testing for Rating Unitary Air Conditioning Equipment – $1 per copy

Std. 47-60—Method of Testing and Rating Return-Line, Low-Vacuum Heating Pumps – 50c per copy

American Standard: ASHRAE Standard 34-57 (ASA B79.1-1960) Number Designation of Refrigerants was approved as an American Standard on September 14, 1960. Copies are available from ASHRAE Sales Department at 75c per copy.

Canadian Standard: A standard concerning the construction and testing of room air conditioners has been published by the Canadian Standards Association. This standard C22.2 No. 117-1960 is available at $1.50 per copy from CSA, 235 Montreal Road, Ottawa 2.

Controls: The Nema standard on refrigeration controls DC7-1960 is available from Nema at 30c per copy. DC7 describes constructional details, classifications, ratings, ranges, differentials and other characteristics of refrigeration controls, capable of handling a current not in excess of 30 amperes or handling directly any motor having a rating not higher than 1½ horsepower direct-current or single-phase alternating-current and 2 horsepower polyphase alternating-current. National Electrical Manufacturers Association, 155 East 44th Street, New York 17, N. Y.

Pumps: The first revision of the 10th edition Standards of the Hydraulic Institute are available from HI, 122 East 42nd Street, New York 17, at $1.25 per set. A complete set of the standards including revisions is available at $6 each. HI standards include centrifugal, rotary, and reciprocating pumps. Within each classification sections cover nomenclature, hydraulic standards, test methods and installation and operating hints.

Baseboard Ratings: A new edition of the I-B-R Baseboard Ratings booklet containing ratings approved and in effect as of September 15, 1960 is now available from Institute of Boiler and Radiator Manufacturers, 608 Fifth Avenue, New York 20, at 75c each. All baseboards listed have been tested in the I.B.R. Laboratories. As additional ratings are approved, supplements to the booklet will be issued by the Institute.

Certification: The ARI Unitary Air Conditioner Certification Program was initiated two years ago and it has become a considerable factor in the industry. Because the standard ratings certified by manufacturers in terms of Btuh seemed the most important phase of the program, this phase has been stressed in publicity and advertising, however, in addition to meeting the rated capacity, units certified must pass four other performance tests under adverse conditions. These tests include: maximum operating conditions test; low temperature operation; insulation efficiency; and condensate disposal. The program has been widely accepted in the air conditioning industry. In addition it has been recognized as a strong indication of the air conditioning industry responsibility by home builders and government groups.

The US Air Force has ruled that any unitary equipment purchased for use in Air Force installations shall bear the ARI Seal of Certification. An amendment to the FHA Minimum Property Specification is expected to contain a requirement for certification of unitary equipment in FHA-financed homes. Under consideration are certification programs for unitary heat pumps, room fan-coil air conditioners, room air induction units, and drinking-water coolers. Other product sections of ARI will give consideration to possible future certification programs.

ASHRAE NATIONAL MEETINGS AHEAD

1961	1962	1963
Feb. 13-16 Semiannual Chicago, Ill.	Jan. 28-Feb.1 Semiannual St. Louis, Mo.	Feb. 11-14 Semiannual New York, N. Y.
June 26-28 Annual Denver, Colo.	June 25-27 Annual Miami, Fla.	

API Research Program to Improve Oil-fired Equipment

As announced at the 40th Annual Meeting of the American Petroleum Institute in Chicago, November 14-16, API has launched a broad program of research directed toward new and improved equipment using distillate fuel. The move becomes a major factor in the oil industry's effort to improve the convenience and appeal of liquid fuel for home heating.

Overall objectives are to develop, interpret and disseminate new technical information to assist manufacturers to provide improved equipment.

As authorized by the API Board of Directors, the program will be initiated in 1961 under the direction of the API Division of Marketing.

In a report to the API Fuel Oil Committee, J. L. Minner of Shell Oil Company and Chairman of the Research Subcommittee charged with the overall planning for the program, described the background and plans for the new research program as "an investment in the future of oil heating." Minner is part of the API's broad effort in expanding fuel-oil markets.

The several areas of activity incorporated in the program are:

- Search for new principles in fuel-oil combustion
- Search for greater understanding of combustion principles both new and old
- Search for ways of exploiting these principles
- Demonstrate principles in bench-scale or prototype equipment
- Interpret research results in terms of their practical application to combustion equipment
- Solve problems which present major obstacles to development of new equipment
- Communicate needed information to developers and manufacturers to stimulate final development and commercialization of equipment.

"Research will be understaken under the API program only in those areas in which needs are not likely to be met by independent efforts of manufacturers. Activities in the API program will be carried to the point of demonstrating principles, but not to the point of providing final equipment design. Manufacturers will be encouraged to complete the development of final details, leading to the introduction of new commercial products. The API program is intended to supplement, rather than to replace, efforts of equipment manufacturers", Minner said.

Last year Minner's Subcommittee contracted for the services of a research team at Battelle Memorial Institute, headed by D. W. Locklin, to make a comprehensive study to appraise the specific research and development needs of the oil-heating equipment industry. This study was completed recently.

The research study and subsequent planning of details for the new research program has had the active guidance of a Technical Advisory Group, composed of specialists from research laboratories and technical departments within the petroleum industry, and headed by C. J. Livingstone of Gulf Research and Development Company.

In 1961, the program will place emphasis on research that holds promise for the development of basically new types of oil-burning equipment. Some of this work will be conducted in independent research laboratories under API sponsorship and guidance. Some will be conducted on a cooperative basis by laboratories of various oil refiners.

The Technical Advisory Group will integrate all efforts in both areas toward the objectives of the total program. The Group has placed a preliminary estimate of the value of this combined effort in the first year at over $1 million.

To provide full-time assistance to the Group in the coordination of all elements of the research program, David W. Locklin of Battelle will be retained as Research Consultant to the API Fuel Oil Committee.

As part of the program, a two-day research conference, is planned for early 1961. This will be a forum for informal discussions between research men of oil companies, equipment manufacturers, and other organizations actively pursuing research or similar developments of distillate-consuming equipment. At this conference, technical details of the API program for 1961 will be discussed. The cooperation and constructive comments of manufacturers—as the ultimate users of the research information—will be solicited.

OFFICES, STORES AND APARTMENTS COMBINED IN ONE BUILDING

Centrally air conditioned, 155 East 55th Street, New York City, has been designed to provide 90 apartments on the upper floors atop a three-story base for commercial usage – shops on the street level and offices on the second and third floors.

In addition to supplying heat and hot water, Consolidated Edison Steam Service, used in conjunction with a 225-ton steam absorption machine, will fully air condition the building. To meet the diverse heating and cooling requirements, peripheral and interior zones have been designed utilizing fan coil units in peripheral office areas and in all apartments. Lobby and corridors, as well as the stores and interior office areas, will be supplied through ceiling diffusers from the interior system.

AT RECENT INDUSTRY MEETINGS

In addition to the news report of the 47th Annual Convention of the National Warm Air Heating and Air Conditioning Association, as presented upon page 68 of this issue, there were several other industry meetings during late November and December whose highlights were as follows:

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATING ENGINEERS – Gathering for its 51st Annual Meeting November 28-December 2 in St. Louis, NAPRE established the theme of integrity, competency, economy – a continuing maxim. The keynote address was by Treasurer W. H. Aubrey of the Air Conditioning and Refrigeration Institute, who discussed "Refrigeration at the Crossroads – Today's Challenge to Engineers."

There were four sessions featuring education objectives. At the first, W. R. Woolrich, (Member ASHRAE) Education Director of NAPRE, discussed the basic objectives for 1961. At the second, W. F. Stoecker (Member ASHRAE) and Robert Niedermeier covered the control of the behavior of the liquid in full-flooded evaporators, while C. H. Cheyney discussed new developments in air handling equipment and A. T. Miller reviewed new offerings in air filters. The educational sessions following brought reviews by N. K. Hall on gas powered mechanical refrigeration; F. L. Rietveld (Associate Member ASHRAE), efficient application of chemical dehumidification systems; and S. E. Mapes (Associate Member ASHRAE), apple cooling.

BUILDING RESEARCH INSTITUTE – At the BRI Fall Conference, November 15-17, Washington, there were discussed adhesives and sealants, plastics, usage of doors, building operation and maintenance, prefabricated panel construction, and paints and coatings.

Paul E. Basler, Executive Secretary of the Building Officials Conference of America, urged developers of pre-assembled components to get together with responsible code organizations before the project is ready for use, not after, in order to help assure acceptance.

Alan E. Brockbank, Chairman of the National Association of Home Builders Research Institute, called for increased use of component parts as the main objective of home building research and cited as hindrances to progress in this direction the need for better fasteners and connectors, improved dimension stability of certain large panels and the problem of handling components larger than 8 x 20 ft.

Architect Carl Koch acknowledged his profession's reluctance to accept standardized parts, but conceded that components, if you use daring and imagination, can not only contribute to the accomplishment of the architect's objective, but can provide better value at the same time.

Ralph J. Short, Director of Engineering Exploration for the Procter & Gamble Co., stressed the possibilities for numerous cost reductions through the use of pre-assembled components and emphasized that these might be missed where there was a lack of long-range research or of adequate organization on each job.

OIL HEAT INSTITUTE OF AMERICA – Approval of OHI participation in an industry exhibit for the 1964 New York World's Fair was activated by a pledge of $25,000 at the recent Cruise Meeting of OHI.

Feature report of the meeting was that upon an air pollution research study by Prof. C. H. Pesterfield (Member ASHRAE) which provided definitive data on the determination of effluent factors, the lack of which has heretofore hindered the industry in its efforts with local and regional pollution control agencies.

It was announced, following this meeting, that the 39th Annual Convention of OHI would be held April 23-27, 1961, in Washington, and that the 40th Annual OHI Convention and 24th National Oil Heat and Air Conditioning Exposition would be held simultaneously, April 8-12, 1962, in Chicago.

WATER CHILLER FOR WORLD'S FAIR

Used in the air conditioning system of the Administration Building now under construction for the 1964-65 New York World's Fair will be a large-capacity Carrier absorption refrigerating machine. Using steam to produce chilled water for the air conditioning system, the chiller will have a cooling capacity of 166 ton.

SYSTEM REQUIRES NO FLOOR SPACE

Selected for the 26,000-sq ft building that comprises the new plant of Aeronautical Electronics, Inc., Raleigh, N. C., were eleven electric Chrysler heat pumps. Hung from the ceiling, the entire heating and air conditioning system requires no floor space and provides clean, filtered air in both the summer and winter.

Two of the interior units serve the general and administrative offices, two the engineering department, one the lunchroom and the remaining six are located in the general manufacturing area, production offices, stockroom and metal working area. Each unit can be adjusted to its individual area, providing zoned heating and cooling.

Change-over from cooling to heating is automatic, with the heat pumps maintaining whatever temperature is set on the thermostats, whether a heating or air conditioning cycle is required.

Meetings ahead

January 8-12 – Thermoelectric Symposium, jointly sponsored by the U. S. Dept. of Defense, ASHRAE and other technical societies, Dallas, Texas.

January 23-24 – Industrial Heating Equipment Association, Dearborn, Mich.

February 10-11–Air Conditioning and Refrigeration Wholesalers, Annual Convention, Chicago, Ill.

February 13-16 – American Society of Heating, Refrigerating and Air Conditioning Engineers, Semiannual Meeting, Chicago, Ill.

February 13-16 – 15th International Heating and Air-Conditioning Exposition, Chicago, Ill.

March 5-8 – National Association of Frozen Food Packers, Annual Convention and Exposition, Dallas, Texas.

March 27-30–National Association of Refrigerated Warehouses, Annual Meeting, San Francisco, Calif.

March 27-31 – Third National Symposium on Temperature. Sponsored by the American Institute of Physics, Instrument Society of America and National Bureau of Standards, Columbus, Ohio.

April 5-7 – Gas Appliance Manufacturers Association, Annual Meeting, Boca Raton, Fla.

April 11-14 – 2nd International Refrigeration and Air Conditioning Exhibition and Technical Convention, sponsored by World Refrigeration, London, England.

April 20-22 – Refrigeration Research Foundation, Annual Meeting, Palm Beach, Fla.

April 23-27 – National Association of Refrigerated Warehouses, Annual Meeting, Palm Beach, Fla.

May 21-24–Industrial Heating Equipment Association, Hot Springs, Va.

June 12-15 – Institute of Boiler and Radiator Manufacturers, Annual Meeting, Absecon, N. J.

June 26-28 – American Society of Heating, Refrigerating and Air Conditioning Engineers, 68th Annual Meeting, Denver, Colo.

News of ASHRAE members

New jobs

Victor H. Berthene, formerly resident representative for York Division of Borg-Warner Corporation, has joined Recony Sales and Engineering Corporation as Assistant to the President.

David E. Morgan has been named Vice President–Contract Sales, Warren Webster & Company, Inc., having been for the past five years Director of Research and Development. An alumnus of Bucknell University, Penn State College and Haverford College, he has served in various major posts with Webster over a period of 18 years. A member of six national technical engineering societies, he has served both as member and chairman of numerous national trade association and government agency committees. His publications activity includes editing and authorship of codes, guides and data books within the fields of heating, air conditioning and refrigeration. Six patents have been issued to him.

Wallace R. Hopkins is now General Manager of Air Conditioning Distributors, Inc. A graduate of the University of Texas, he will expand the company sales engineering force and cover the entire northwest Texas area.

H. B. Wood is one of three principals of the newly formed Bernhard Associates, a firm of mechanical equipment manufacturers' representatives. He was formerly a contractor-sales engineer for Carrier Equipment in Tyler, Texas, and for the last ten years has been with a manufacturers' representative.

John E. Craig, appointed General Sales Manager of Welbilt Air Conditioning and Heating Corporation, will be responsible for all sales, promotion and advertising activities of the organization. Joining Welbilt after three years as Sales Manager for the air conditioning and heating div of Crane Company, he has been a regional manager for Chrysler Airtemp, Sales Manager for United States Air Conditioning Corporation and, more recently, has been associated with regional merchandising operations of Carrier Corporation. He is a 1934 graduate of Dayton University.

Sarto Plamondon, a long-time member of Montreal Chapter who went to a post in Egypt a year ago, is now back in Canada with the University of Montreal as Assistant Director of the Research Institute in Industrial Hygiene. Other Chapter members with new positions are **Herb O'Connor,** formerly with Sturtevant in Vancouver, who has now returned to Montreal with the same company; **Peter R. Zimoulas,** leaving Forget & Powell to join E. C. Scrivens; and **John Lowcock,** past-Chairman of the former ASRE Section, who is moving to the Toronto office of J. & E. Hall.

George R. Wertz, Jr., Minneapolis District Manager for B. F. Goodrich Industrial Products Company, a division of B. F. Goodrich Company, has been named Chicago District Manager for the division. An alumnus of Ohio Wesleyan University, he joined Goodrich in 1936 in production control, transferring to industrial product sales in 1937. Holding a number of assignments in Akron before transfer to Erie, Pa., in 1950, he also served in the Cleveland area. He was named Minneapolis District Manager in 1957.

Necrology

Bertram M. Natkin, Manager of Apartment House Sales, Hot Point Division, General Electric Company, died on October 24 at the age of 51. With General Electric since 1950, he previously had been Vice President of Natkin & Company.

Louis K. Berman, Chairman of the Board of Raisler Corporation, died November 30th after a brief illness. He was 74 years old. Associated with Raisler since 1910, he was President from 1930 to 1956 and had been on the Board of Governors of the Mechanical Contractors Association of New York.

William H. C. Ness, President of Master Fan Corporation and past-President (1934-35) of Southern California Chapter of the former ASHVE, died September 26th of leukemia. He had joined the Society in 1931.

Martin Langberg, deceased, was President of Charles Hartmann Company. He had served previously as Vice President of Carroll Sheet Metal Works, Inc., and President of Alpine Sheet Metal & Ventilating Company, Inc.

Thomas Chester, Life Member ASHRAE and retired Chief Engineer of American Blower Company, died October 29 after a long illness. He was the author of an engineering text book for American Blower.

Honors and recognitions

Willis F. Thompson, Executive Vice President of Westcott and Mapes, Inc., Fellow and former Vice President of the American Society of Mechanical Engineers, has been elected President of United Engineering Trustees, Inc. Widely reputed for his contributions to design and construction of steam-electric power plants, he has been in direct charge of design in connection with steam plants for public utilities and industrial plants, as well as design of office buildings, commercial structures, institutions, schools, and other major projects. Within ASME he has served, in addition to the vice presidency, as Chairman, New Haven Section, and as a member of the Power Show Advisory, Membership Development and Power Test Codes Committees. He has been a Director of the Engineering Foundation and a member of Engineers Council for Professional Development. In his former post as Chairman of the UET Real Estate Committee, he was a driving force in the program resulting in the new United Engineering Center.

James N. Landis, Vice President of Bechtel Corporation, has been elected President of Engineers Joint Council. Member of Council and past-President of the American Society of Mechanical Engineers, he has served mainly in the power field. After a term as a mathematics instructor at the University of Michigan, where he received a B.S. in 1922, he joined Brooklyn Edison Company in 1923, remaining until 1936. From 1936 to 1948 he was with Consolidated Edison, which he left to join Bechtel as Chief Power Engineer. He became Vice President in 1953.

John D. Bopp of Ansul Chemical Company has been awarded an honorary membership in the Midwest Association of Refrigeration Service Engineers Society, presentation of which was made at the annual banquet of the association. Cited were contributions made by the recipient to growth of the organization.

R. K. Serfass (pictured), Manager of Westinghouse Electric Corporation's Air Conditioning Division at Staunton, Va., was elected President of the Air-Conditioning and Refrigeration Institute at its Annual Meeting. Vice President and Chairman of the Institute's Planning Committee for the past year, he has been active in the affairs of the association over a long period of time. A graduate of Lehigh University, President Serfass was connected with York Corporation for 25 years before joining Westinghouse in his present post in 1958. He had been a vice president of York at the time of his resignation. He succeeds **Rudolf G. Berg,** Vice President of Copeland Refrigeration Corporation, as chief executive officer of the Institute. Re-elected as Vice Presidents were **Russell Gray,** Executive Vice President of Carrier Corporation, and **L. N. Hunter,** ASHRAE past-President and Director of Engineering for Crane Company's Plumbing, Heating & Air Conditioning Group at Johnstown, Pa. Re-elected as Treasurer was **W. H. Aubrey,** President of Frick Company. Three newly-appointed Directors of the Institute are **Cecil Boling,** ASHRAE past-President and President and Treasurer of Dunham-Bush, Inc., **L. P. Benua,** Executive Vice President of Ebco Manufacturing Company, and **J. G. Landrigan,** General Sales Manager of United Wire & Supply Corporation.

Others are saying—

operating conditions . . . of semiconductor cooling devices have been examined and reported on, with a detailed analysis made of the refrigerating capacity of the thermopiles and of its dependence on a number of factors. A more accurate expression is cited as having been obtained for dependence of the Peltier effect upon the temperature of the cold junction. *Refrigeration Techniques (Xolodil'naya Technika), September-October 1960, p 26 (Russia).*

refrigerant flow-rate measurement . . . . has been accomplished by methods based on evaporator and condenser heat balances and, additionally, by means of a heat balance applied to the refrigerant in the liquid or vapor phase. To eliminate disadvantages of these methods, a form of calorimeter was constructed to investigate the possibility of measuring flow-rate by applying cooling to the liquid. Measurement of heat from the liquid was done on the principle of Bunsen's ice calorimeter, the contraction in volume of ice when it melts into water. *Journal of Refrigeration, September/October 1960, p 116 (England).*

heating a theatre . . . by means of a heat pump has proven to be more economical than through use of a central boiler plant in tests conducted as outlined in this paper. The installation cited operates in summer as a refrigeration machine, using single-stage units utilizing Refrigerant 12. *Refrigeration Techniques (Xolodil'naya Technika), September-October 1960, p 22 (Russia).*

air conditioned schools . . . are the natural result of current design trends towards compactness, better environmental control (such as elimination of glare, heat and visual distraction) and lessening dependence on windows for illumination. What this has led to is a reorientation in planning in which the visual environment is more closely related to educational needs and the thermal environment is under constant, year-round control. *Architectural Record, November 1960, p 186.*

What ASHRAE Chapters are doing

News reports from 50 Chapters appear on this and accompanying pages. There are 91 Chapters and Branches of ASHRAE. It is the objective of the Editors to present news of each Chapter in every issue, but this can be done only with the cooperation of Chapter officers. We welcome news of timely significance. *Editors.*

IOWA . . . ASHRAE President Walter A. Grant was guest speaker at the November 2nd meeting. Highlights of the talk were major problems facing the Society, including finances, membership interest, publications and research. Regarding membership interest, President Grant explained that every effort is being made by the Society to serve the "special interest" groups by organizing members engaged in special activities into self-generating, self-sustaining groups.

Regarding publications, he pointed out that the Guide and Data Book will be combined into one volume for the next edition. The research policy of the Society is being re-examined to answer such questions as: Toward what field should our research be directed? How large should the research program be? How should this program be implemented? Recommendations will be made to the national Board of Governors at the February meeting in Chicago.

HOUSTON . . . "Noise Control in Air Conditioning Systems" was considered by Charles W. Rink of Industrial Acoustics Company, Inc., at the November 18th meeting. A question and answer period followed his address.

who's doing what . . . D. Dana Price, reporting on Engineers' Council activities, stated that the Chamber of Commerce has speakers available. Professor Wayne E. Long was nominated by Harold Broadwell to receive the annual award of the Life Members' Club.

AUSTIN . . . Panelists speaking on system balancing at a recent meeting included William Winn, representing mechanical contractors; Robert Cherry, speaking for control manufacturers; and James Purdy, representing the engineers. Atwell Lagow moderated the discussion, opening with the statement that the system balancing paragraph included in most contracts was intended to obtain operating data on a system in order to prove that the system is operating efficiently, so that, in the event of future trouble, a written report can be submitted to the owner showing that the system had operated properly.

Speaker Purdy introduced different system balancing specifications: that the contractor, in the presence of the engineer, shall test the ability of the equipment to meet the conditions specified and, at his own expense, make whatever adjustments are necessary; or that the contractor shall utilize a different testing company to perform the various test services.

Hiring outside experts was considered by speaker Winn to be a good idea; however, he suggested that if the contractor has the ability and equipment to balance the system, then he be allowed to do so.

It was the contention of Robert Cherry that the purpose of hiring an outside testing concern is to get unbiased test results. Most contractors, he stated, are capable of turning in reports that are adequate for testing purposes; however, not enough thought is given to how testing should be accomplished during installation. Responsibilities of the control contractor were cited by him as being connection, setting and calibration of all dampers, motors and valves; checking operating sequence of dampers and valves and verification of their positioning; and to assist electrical and air conditioning contractors in starting major equipment.

who's doing what . . . Wayne Long, Chairman of the Project Committee, will supervise Charles Kieffer, a University of Texas student, in testing and report writing for the Chapter project of developing a standard for field testing of an air-cooled condenser.

NEW YORK . . . While fan coil units have always had widespread use in office buildings, hotels and motels, it is only recently that they are being used frequently in construction of air conditioned apartment houses. Increasing application of individual

CHAPTER MEETING DATES

	Jan.	Feb.	Mar.
Alamo	—	—	—
Arkansas	17	21	21
Atlanta	9	13	13
Austin	10	16	16
Baltimore	5	2	2
Baton Rouge	18	15	21
Boston	—	—	—
British Columbia	11	15	15
Central Arizona	9	6	6
Central Indiana	10	25	14
Central Michigan	10	14	14
Central New York	11	—	8
Central Oklahoma	9	13	13
Central Pennsylvania	9	8	8
Cincinnati	—	—	—
Cleveland	9	13	13
Columbus	16	20	20
Dallas	16	20	20
Dayton	10	14	14
El Paso	16	20	20
Evansville	3	7	7
Florida West Coast	—	—	—
Fort Worth	—	—	—
Golden Gate	—	—	—
Hampton Roads	3	7	7
Houston	20	17	17
Illinois	9	13	13
Illinois-Iowa	16	20	20
Inland Empire	9	13	13
Iowa	9	13	13
Jacksonville	—	—	—
Johnstown	10	14	14
Kansas City	3	6	6
La Ville de Quebec	10	14	14
Long Island	—	—	—
Louisville	9	13	13
Manitoba	26	23	23
Memphis	16	20	20
Michigan	—	20	20

fan coil units serves to focus more attention on the many factors to resolve in design, operation and control of this type of system. Speaking at the November 22nd meeting, Kenneth W. Wicks, Regional Manager of Marlo Coil Company, took up such considerations as a method of resolving the varying demand of peripheral systems, locating units for optimum performance, air distribution problems, performance during intermediate seasons and various control methods used to satisfy the occupants of individual spaces.

Third of the Fall series of Technical Seminars was concerned with finned coils, their design, application and selection. Speaking were Rolf Seebert of Marlo Coil Company, Herbert Boss of Aerofin Corporation and Walter Kane of Air-Pak Products.

who's doing what . . . Edwin H. Schoen of the Special Events Committee reported on the Technical Seminars to be held in January and February, selected topics for which are insulation and air filters, respectively. Robert Bald of the Education Committee reported on the T.S.C.N.Y. Career Conference which he had attended and reminded members of a student tour of the Union Carbide Building, scheduled for December 5th.

CENTRAL PENNSYLVANIA . . . Covering a new product in packaged water heaters, L. J. Morgan and William Stranko of Patterson-Kelley Company spoke on the "P-K Scale-Free Gas-Fired Water Heater" at the November meeting. Scale-free feature of the unit is accomplished by use of two connected fin tube bundles, one located in the fire tube and the other in the service water storage area. Distilled water under pressure is circulated through the tube bundles, resulting in a 220 to 250 F rise.

who's doing what . . . Delegate Ray Metz reported in detail on the 1960 Regional Convention, held at Williamsburg, Va. A. H. Stengel offered the facilities of Lebanon, Pa., for the 1962 Regional Convention.

CINCINNATI . . . Illustrating his talk with slides, Charles G. Wright of American Air Filter Company discussed proper selection of air cleaning equipment, covering all types of filters except those utilized for odor control. Construction and application of activated carbon filters for odor control were detailed by Harold H. Todd, Jr., of Dorex Division, Connor Engineering Corporation. Filtration was considered as a means of reducing the amount of outside air needed for air conditioning systems.

At the November meeting, Dr. C. Mills of the University of Cincinnati spoke on "Application of Principles of Quantum Mechanics to Radiant Cooling and Heating of Products or People."

who's doing what . . . Treasurer Norbert Rau and Secretary Calvin Kummer will be working together to bring the membership roster up to date.

ILLINOIS-IOWA . . . Sound power levels were compared with sound pressure levels by William Morrison, Chief Engineer of Research, Jenn-Air Products Company, guest speaker at the November 21st meeting. Sound and its amplification was the topic of discussion.

who's doing what . . . J. D. Koetter has been nominated to the Society's General and Technical Committees.

LONG ISLAND . . . Members of a panel on "Design and Selection of Refrigeration Accessories" were W. A. Reichenbach, Sporlan Valve Company; L. L. Patalita, Carrier Corporation; and T. J. Phillips, Alco Valve Company.

During the business meeting, Vice President S. L. Gayle asked for a discussion by the members as to whether or not a trip to Brookhaven would be of special interest. The membership approved the idea.

who's doing what . . . William Evanchick reported for the Membership Committee that five new members have been admitted.

TUCSON . . . Daniel D. Wile, immediate past-President of ASHRAE, was guest speaker at the November 15th meeting. His talk, "Modern Trends in Industrial and Commercial Refrigeration," was followed by a question and answer period.

KANSAS CITY . . . Attending the November 3rd meeting as a special guest, ASHRAE President Walter A. Grant spoke briefly on problems which have faced the national Society, and progress made in overcoming them.

Speaker of the evening was Harold L. Stout, Assistant Director of the Engineering Division, Midwest Research Institute. Discussing "Research Trends," he brought up the subject of accelerating progress. Thermal electricity, fuel cells, nuclear power plants and research of metals and alloys will be important future projects, he contended.

WESTERN MASSACHUSETTS . . . First speaker at the November meeting was Howard Cadwell, President of Western Massachusetts Electric Company, who

	Jan.	Feb.	Mar.
Middle Tennessee	10	14	14
Minnesota	9	13	13
Mississippi	23	27	27
Mobile	23	27	27
Montreal	16	20	20
National Capital	11	8	8
Nebraska	10	14	14
New Mexico	—	—	—
New Orleans	—	—	—
New York	24	28	28
Niagara Frontier	9	6	6
Niagara Peninsula	3	7	7
North Alabama	—	—	—
North Jersey	—	—	—
North Piedmont	13	10	10
Northeastern New York	16	16	20
Northeastern Oklahoma	—	—	—
Northern Alberta	—	—	—
Northern Connecticut	19	9	16
Northern Ohio	—	—	—
Ontario	2	6	6
Oregon	12	16	16
Ottawa Valley	—	—	—
Panama & Canal Zone	—	—	—
Philadelphia	—	9	9
Pittsburgh	16	20	20
Puget Sound	10	14	14
Rhode Island	11	9	8
Richmond	—	—	—
Rochester	4	1	1
Rocky Mountain	—	—	—
Sacramento Valley	—	—	—
St. Louis	16	16	20
San Diego	10	14	14
San Joaquin	—	—	—
Savannah	—	—	—
Shreveport	19	16	16
South Carolina	16	20	20
South Florida	10	14	14
South Piedmont	—	—	—
Southern Alberta	17	21	21
Southern California	9	20	13
Southern Connecticut	12	9	9
Toledo	9	—	6
Tucson	3	7	7
Utah	20	17	17
West Texas	27	24	24
Western Massachusetts	19	16	16
Western Michigan	9	6	13
Wichita	16	20	20
Wisconsin	16	20	20

discussed advantages of electric space heating for residential, industrial and commercial applications. He described various installations in the New England area.

Walter Fisher of General Electric Company, second speaker of the evening, detailed various methods of heat gain for winter heating and compensation for higher air conditioning load developed during the summer months because of the lighting fixtures. In his discussion he enlarged upon the idea of using rejected heat from lighting fixtures for area heating. Concluding his talk, he listed numerous applications and advantages of electric heat pumps for residential, industrial and commercial use.

CLEVELAND . . . "Factors Affecting Selection of Cooling Equipment" was under discussion at the November 14th meeting. Beginning the session, Ralph Crandall of McGeorge, Hargett & Hoag, Architects, outlined items to be considered by an engineer in selection of prime equipment. Availability of power sources, excess steam capacity, proximity of air handling units to refrigeration equipment, decibel ratings that cannot be exceeded and final temperatures that must be maintained are important factors, he declared.

Four types of refrigerating machines were described by representatives of manufacturers. Discussing the absorption cooling cycle and its control was Michael Higgins of Trane Company; centrifugal machines, single and double-stage and with both electric and steam turbine drive, were considered by Donald Taze of American Blower; Raymond Johnson of York Corporation spoke on the reciprocating machine and areas in which it is the best solution to refrigerating problems; and the steam vacuum refrigeration system, its limitations and advantages, was discussed by David Hall of William Wilson Company.

DAYTON . . . Information on research trends in the U.S. was presented at the November 8th meeting by Burgess H. Jennings of Northwestern University, ASHRAE Research Laboratory Director, in his discussion of "Reactions of Man to Inside Environment." He reported on the Society's research program with particular emphasis on studies being carried out to define more clearly effects of indoor environment on man. Of special interest was his discussion of reasons why recent comfort test results differ from equally valid test results of 25 years ago and from results of tests conducted in England.

OREGON . . . Six student members from Oregon State College Chapter attended the November 17th meeting. George Thornburgh introduced them and announced that there were presently 22 student members.

Physical properties of aluminum and certain techniques of fabrication were detailed by John R. Young of Kaiser Aluminum & Chemical Sales Company in an address on "Aluminum in Warm Air Heating and Cooling Duct Systems." Information presented included friction loss through duct work and duct heat losses and gains. Speaker Young cited a test report on noise in aluminum ductwork that indicated the noise level to be approximately the same as for galvanized steel ductwork.

Regional Director T. J. White presented a brief discussion covering possibilities of a name change for the Chapter and indicated the extent that a Chapter can enter into legislative and code actions.

Third speaker of the evening was Dr. Jalmar Johansen of Gotthenberg, Sweden, who spoke on "A Fulbright Scholar's Views on American Education and Society."

BOSTON . . . Opening the discussion at the November 15th meeting, Joseph C. Mahlbacker, President of American Statronic Corporation, described a method of dirt and dust control in air conditioning systems. Following him, Michael H. Pelosi, Jr., Director of Engineering and Sales at CRS Industries, presented a more technical discussion of the Statronic system, explaining that the product designation is derived from "static electronic."

Slides were shown illustrating primary and secondary air circulation and detailing how the system shatters particles of dirt and dust by passing air through a series of static screens having an intense electric field. Used to generate the field is a static generator operating at 25,000 volt.

who's doing what . . . Professor Samuel C. Collins of Massachusetts Institute of Technology has been nominated by the Chapter for an award to be made during National Engineers Week. William F. Lynch, Membership Chairman, announced receipt of four new applications for membership.

CENTRAL ARIZONA . . . Raymond W. Bliss, Jr., of the Solar Engineering Laboratory, Institute of Atmospheric Physics, University of Arizona, showed slides, at the November 7th meeting, of the laboratory building and spoke on applied solar energy.

who's doing what . . . Bill K. Haggard of the Membership Committee reported addition of two new members to the Chapter, William Hazzard of American Blower Company and James Button of Carns-Hoaglund.

ONTARIO . . . Debated at the November meeting was the idea of a windowless school room, with Harvey Self of the Toronto Board of Education as Moderator, and G. Granek, J. A. Murray, David Horne and Dr. M. F. Grapko as panelists.

Speaker Granek introduced the subject, reviewing the trend from standard window design to all window and no wall and finally to all wall and no window. Since this new design will add cooling to the normal heating and ventilating requirements of a standard building design, he stated, a new phrase, "climate control," will replace the term "air conditioning."

In the debate which followed, J. A. Murray took the negative and David Horne the positive points of view. On the negative side were mentioned physiological and psychological reactions to the static environment, loss of awareness of atmospheric changes and living under artificial conditions. Speaker Horne cited the basic need for intensity of learning, elimination of distraction and improve-

ment in concentration as advantages of this new approach to schoolroom design.

Dr. Grapko then discussed these problems from the medical point of view, reiterating speaker Murray's comments but pointing out that, depending on the individual, they would not be insurmountable. He noted that submarines and windowless factories arouse feelings of suffocation or isolation due to the effect of confinement, but that these reactions were negated by proper training and indoctrination.

Following a question and answer period, slides were shown depicting several designs of this new type of school.

NORTH ALABAMA . . . "Contractor Insurance and Bonds" was presented at the November meeting by G. William Blair, Executive Vice President of Leedy-Glover, Inc.

SOUTH CAROLINA . . . W. E. Freeman of W. E. Freeman & Associates, H. J. Haar of J. C. Harrison, Thomas Able of Fiske-Carter Construction Company and Francis Freeman of Freeman Heating & Air Conditioning were members of a panel which met at a recent meeting to discuss "Coordinating Building Design and Construction with Air Conditioning System Requirements." Moderating the group was Robert Knowles.

NIAGARA FRONTIER . . . Program for the November 7th meeting consisted of a tour of the Bethlehem Steel Office Building. This was also Student Night, and the meeting was attended by 13 students and instructors from Alfred University. Major point of interest in the tour was the high pressure induction system, with steam absorption refrigeration.
who's doing what . . . Richard Bartsch was appointed to set up a Telephone Committee with the help of Frank Collins, Robert Jameson and William Maloney. Charles Stone, Delegate to the Regional Meeting, reported on proceedings at the meeting.

TOLEDO . . . Held at the Sohio Refinery, the November 7th meeting consisted of a brief talk given by Mr. Hall of the refinery and a field trip through the installation. Highlight of the tour was a visit to the nerve center which controls the operation. Comprising the center is a 96-ft curved graphic panel with which engineers are able to monitor activities of the refinery.

CENTRAL INDIANA . . . On November 8th, this Chapter held its annual meeting as guests of the Purdue University Student Branch. In his talk on "Reaching for the Sun," Joseph D. Pierce, a Chapter member, outlined advances in the fields of heating, ventilating and air conditioning during the past 25 years and predicted possible future developments.

He noted that development of forced circulation of hot or chilled water and of high velocity air systems has removed many of the limitations of previous systems and has permitted great flexibility of design. Also cited was the trend towards reduction in size and weight of equipment. In conclusion, speaker Pierce predicted that heating systems of the future will operate on atomic energy, fuel cells or by means of converting solar energy into electricity.

MONTREAL . . . Choice of topics was offered members at a recent meeting of this Chapter, with S. R. Mester of Needco Cooling speaking on "Principles and Applications of Thermo-Electric Materials" and Lloyd Hay presenting a discussion of "Fuels and Combustion." Members divided into two groups to hear the speakers.

History of thermo-electricity was outlined and the discoveries of Seebeck and Peltier were mentioned in the introduction of his subject by speaker Mester. Samples of thermo-electric heat pumps were shown, application of which is in spot cooling of components in electronic apparatus.

Origin of fuels, classes or grades of fuel oils available and method of production were explained by speaker Hay, who proceeded to outline adverse effects of using the wrong grade of oil and some of the hazardous and corrosive properties of oils. He then opened the discussion to questions from the floor.

SOUTHERN PIEDMONT . . . Diagrams, shown by S. E. Johnson of Carrier Corporation during his talk on "Large Tonnage Lithium Bromide Absorption Package Refrigeration Equipment," illustrated types of equipment, operation and applications.
who's doing what . . . Membership Chairman J. M. Trotter presented four new applications for membership.

NORTH JERSEY . . . To make medical refrigeration efficient, according to Dr. Lawrence Gilbert, a specialist in heart and lung treatment and guest speaker at the November meeting, there is need for closer cooperation between medicine and engineering. No techniques now available for cooling of patients, either externally by environmental means or internally by chilling the blood, are considered satisfactory enough to give doctors the extra time required for security of patients and surgical accuracy in certain types of operations.

ST. LOUIS . . . Tracing the history of sound from the invention of the telephone to the present, David Hargis of Southwestern Bell Telephone Company spoke on "The World of Sound" at the November meeting. Demonstration equipment included a large screen oscilloscope which showed the difference between pure sound tones, harmonics, musical instruments and speech. A portable stereophonic tape recorder was used to point out the audio differences between earlier recording equipment and present day standards.

MISSISSIPPI . . . Members attending the November 28th meeting were shown a film on fire prevention by B. H. White, which was preceded by a report on the Regional Meeting in Kansas City, presented by Burt Lomax, Jr.
who's doing what . . . Bowden Palmer reported on the progress of the Warm Air Training Program,

stating that the program has resulted in improvement in quality of the work of installers.

OREGON STATE COLLEGE . . . Subject of a talk by Don Benz, President of the Benz Company, given at the November meeting, was "Industrial Air Filtering Methods and Equipment."

Chapter President Charles Bullock reported on a reply received from the ASHRAE Committee on Education, listing several colleges offering scholarships in refrigeration and air conditioning.

CENTRAL NEW YORK . . . Technical Chairman Jack Rasch informed members attending the November 9th meeting that the Technical Forum for that evening was on "Basic Heating and Cooling Loads." Rule of thumb methods, calculated results, storage and diversification factors were discussed by Maurice Wilson, William Stockford and James Horton of Carrier Corporation.

Guest speaker for the meeting was James R. Dorris of Trane Company, whose topic was "Refrigeration Piping and its Importance to a Proper Air Conditioning System."

MIDDLE TENNESSEE . . . Information on residential air conditioning resulting from the "Austin Village Project" was presented at the November meeting by C. W. Nessell, Home Comfort Analyst for Minneapolis-Honeywell and Chairman of the Field Investigation Committee of the National Warm Air Heating and Air Conditioning Association.

ROCHESTER . . . "Progress in Residential Space Heating" was detailed by Michael A. Rohde of Rochester Gas & Electric Corporation, speaking at the November 2nd meeting.

who's doing what . . . Chapter President H. J. Dyminski reported on the recent Regional Meeting, held in Boston. L. Engelhart spoke on the United Engineering Center Building Fund.

NORTHERN CONNECTICUT . . . Presented in film form, the subject for the November 17th meeting, "Water Treatment and Corrosion," was sponsored by International Nickel Company and discussed by L. P. Boyer of Alken-Murray Company. Corrosive action of water, together with required treatment, was illustrated and explained. Included in the presentation were rust, scale build-up and flow resistance.

CENTRAL MICHIGAN . . . Industrial ventilation was discussed at the November 10th meeting by Kenneth E. Robinson, guest speaker for the evening and a member of the Research Staff, General Motors Corporation Industrial Hygiene Department.

PHILADELPHIA . . . Moderator of the Technical Session at the November 10th meeting was John R. McKinley, Executive Director of A. E. D'Ambley, Consulting Engineers. Comprising the panel, which spoke on "Pump Seals – Application and Problems," were Richard Kutzleb, Jr., of Government Employees Insurance Company, Sidney Sussman of Water Service Laboratories, Inc., R. J. Hunt of Chicago Pump Company, and A. J. Solari of Crane Packing Company.

who's doing what . . . Otto Nussbaum reported on activities of the Technical Committee with respect to the Heating Seminar (see page 92). Paul Yeomans reported on the Regional Meeting, held in Williamsburg, Va.

SACRAMENTO VALLEY . . . Commenting on the need for water and on sources in various parts of the state, Herbert Gredonis of California State Department of Water Resources was guest speaker at the November 2nd meeting. After discussing methods of providing new water service to the San Francisco Bay area, he reviewed financial aspects of the problem.

PUGET SOUND . . . Speaking at the November 15th meeting, T. J. White, Region X Director, brought the membership up to date on matters of regional and national policy. Following this, J. R. Young, Kaiser Aluminum and Chemical Sales, spoke on design and application of aluminum in air duct systems.

who's doing what . . . Rod Kirkwood, Chairman of the Membership Committee and 2nd Vice President, is preparing the 1960-61 membership roster for the Chapter.

TOLEDO . . . Speaking on "Air Conditioning Systems for Multi-Story Buildings," Ray Johnson of York Corporation began his talk, presented at the December 5th meeting, by stating that he intended to confine his remarks to four basic systems: fan-coil, dual duct, induction and three-pipe. Five requirements, he averred, must be satisfied to condition properly a given space; these are: humidity, ventilation, temperature control, air filtration and air circulation. Speaker Johnson discussed the basic systems with regard to how each was able to fulfill these five requirements.

who's doing what . . . Clyde Stoneking, reporting on the United Engineering Center Fund, stated that the Chapter has already reached 70% of its goal.

CENTRAL OKLAHOMA . . . Project Echo, the communications satellite, was the major topic of discussion at the November 7th meeting, with Wayne Sherman, Engineering Department, Southwestern Bell Telephone Company, as guest speaker. A film depicting development and operation of the project was shown.

UTAH . . . Guest speaker at the November 25th meeting was William Rowe Smith, who addressed members on "Base Bid Specifications." He stated that there are three types of bidding currently in use in the Utah area: "or equal" specifications, where any material is acceptable as long as it meets the minimum requirements; "multiple choice," which is similar to "or equal," except that various choices are specified; and "base bid," where the architect and engineer have complete control over the material required to be installed on the project. Changes and variations to the last type of specifi-

cation can be made only with the approval of the architect.

NEW ORLEANS . . . Meeting on November 15th, a panel comprised of Leo J. Vivien, Chief Mechanical Inspector, New Orleans Division of Regulatory Inspections; George W. Flach, Chief Electrical Inspector, New Orleans Division of Regulatory Inspections; Felix G. Fischer, Supervisor of Plumbing, New Orleans Sewerage and Water Board; and Oswald S. LaPorte, Director, New Orleans Fire Prevention Division, discussed "How Can the Mechanical Industry Assist in Administration of the New Orleans Building Code?" After introductory comments outlining the organization of the city government and jurisdiction relating to buildings, plumbing and fire prevention, written comments were submitted to the panel by the membership.

ATLANTA . . . W. W. Caines, Southeastern Regional Service Manager of Carrier Corporation, spoke on "Free Maintenance" at the November meeting, stressing the need for better initial equipment installations, such as placement of valves in convenient locations, to reduce maintenance costs.

"Additional Frontiers in Industrial Development in Georgia" was the subject of the December talk.

BALTIMORE . . . Slides were used in conjunction with the December address on "Noise Control in Air Handling Systems," given by Charles Rink of Industrial Acoustics Company.

Announcements made at the meeting noted election of five Chapter members to Life Membership of the Society and detailed plans for a joint meeting with National Capital Chapter, to be held January 5th.

SOUTH FLORIDA . . . "Corrosion Problems in Boiler Plants and Their Solution" was the topic of E. Stan Nelson, Vice President of the Fred H. Schaub Engineering Company, guest speaker at the November 15th meeting. He suggested some specific ways to reduce corrosion through use of deaerator systems.

NORTH PIEDMONT . . . Speaking on "Heat and Power from the Sun" at the November 11th meeting was Henry Voegeli of American Brass Company. An informal question and answer period followed his talk.

MICHIGAN . . . Reviewing the history of thermoelectric refrigeration from its discovery in 1821 to the present, Royal S. Buchanan, Assistant Director of Engineering and Research, Kelvinator Div, American Motors Corporation, noted that the most progress in this field has been made in the last ten years, due to the development of semi-conductors of bismuth and tellurium. The present Factor of Merit for this compound is approximately 3.5×10^{-3}, with a probable limit of 5.0×10^{-3}. Required to make thermoelectric appliances competitive with conventional equipment is a Factor of Merit of 10.0 $\times 10^{-3}$. Another limitation cited by the speaker is the lack of low priced direct current equipment for low voltages.

No noticeable effect on conventional heating or cooling methods was anticipated by speaker Buchanan for several years, at the present rate of progress. Several commercially important uses now are infra-red detector cooling, fluorescent lamp spot cooling and control of laboratory baths.

CHAPTERS REGIONAL COMMITTEE
MEETINGS AND CONFERENCES

REGION II, Quebec Chapter (Quebec), May 12 (Meeting)
REGION VIII, Shreveport Chapter (Shreveport), April 21-22 (Conference)
REGION IX, El Paso Chapter (El Paso), April 24 (Meeting)
REGION X, Central Arizona Chapter (Phoenix), April 28-29 (Conference)

PITTSBURGH . . . "Modern Instruments and Testing Equipment in Air Conditioning and Refrigeration," discussed at the November 21st meeting by Emmett C. Williams, President of Airserco Manufacturing Company, was accompanied by slides illustrating the various instruments which have been developed for analyzing hermetic compressors and vacuum systems. Additionally, a general discussion cited various applications of these instruments and results obtained by using them.

FLORIDA WEST COAST . . . Slides and movies of missile testing and test facilities at Cape Canaveral were shown at the November meeting by Major M. L. Bonham of the Air Force Missile Test Center.

COLUMBUS . . . Free piston developments and new power sources of other types of compressors were covered by the November Coffee Talk speaker, R. J. McCrory of Battelle Institute.

Main speaker of the evening was W. T. Gove of Minneapolis-Honeywell Regulator Company, who discussed automation of temperature control equipment, primarily that of large buildings.

EL PASO . . . Nominating Committee Chairman Jack True reported the following nominees for office for 1961: President, John Holland; Vice President, R. O. Gibson; Secretary, Harold Wortmann; Treasurer, Edgar Mitchell; and Board of Directors, Richard Neumann and Clarence Albrecht.

At the November 21st meeting, Al Hutchet presented a film on "Copper Tubing in Building Construction."

JOHNSTOWN . . . Hot water heating design was the subject presented at the November meeting by T. Robert Stevens of Sarcotherm Controls. Also discussed was correct installation, once the design has been decided upon.

Candidates for ASHRAE Membership

Following is a list of 126 candidates for membership or advancement in membership grade. Members are requested to assume their full share of responsibility in the acceptance of these candidates for membership by advising the Executive Secretary on or before January 31, 1961 of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted by the Board of Directors.

Note: * Advancement † Reinstatement

REGION I

Connecticut

COOPER, R. E. JR., Sales Engr., The Home Oil Co., New Canaan.
LOVELAND, W. B., Mgr. Engr., Installation Dept., The Home Oil Co., New Canaan.

Massachusetts

BAILEY, D. B., Sales Engr., The Powers Regulator Co., Dorchester.
BRADBURY, E. H.,* Elec. & Chief Engr., Liberty Mutual Insurance, Boston.
COTTI, J. JR.,* Pres., Cotti Laurence Co., Weymouth.
DELL ORFANO, ANTHONY,* Owner, Deleco Inc., Boston.
ERBETTA, ANTHONY,* Pres., Boston Air Conditioning Co., Medford
VAN HORN, C. T., Plant Engr., Sylvania Electric Products, Inc., Needham.

New Jersey

CONSORTI, P. T., Owner, State Pipecovering Co., Paramus.
EROH, FRANK,† Hgt. & A-C. Repr., South Jersey Gas Co., Atlantic City.
HEINRICHSON, D. C., Chief Estimator & Designer, Geo. Varick Co., Clifton.

New York

ARTECA, NICHOLAS,† Engr., H. G. Junger Co., Inc., New York.
BAILEY, HAROLD, Sales Engr., Al Druhm & Co., Inc., Blue Point.
BOEMI, HENRY,* Pres., Albert Fentzlaff Inc., New York.
BUTLER, R. H., JR., Chief Engr., E. W. Hoffmann, Inc., W. Hempstead.
CARBONE, J. E., Engr., Syska & Hennessy, Inc., New York.
COMBS, R. O., Equipment Repr., Petro, Mineola.
CYMBALIST, L. D., Sales Engr., Orr & Sembower, New York.
ELSEA, RALPH, Supv. General Application Section, Carrier Corp., Syracuse.
FARRAR, J. H., Sales Engr., Rockwell Mfg. Co., New York.
FITZGERALD, E. A., Chief Engr., Chapman Evans & Delehanty, New York.
GAWMAN, DOUGLAS,† Proj. Mgr., Syska & Hennessy, Inc., New York.
HOLLANDER, B. A., Design Engr., Port of New York Authority, New York.
JONES, A. W. JR., Appli. Engr., Carrier Corp., Syracuse.
KAGAN, BERNARD, Sales Engr., Altherm Inc., New York.
KRIGBAUM, T. H., Sales Engr., General Electric Co., Syracuse.
KRONICK, J. S., Pres., Capitol Temptrol Corp., Mt. Vernon.
LULEICH, E. A., Sales Repr., Benjamin Foster Co., Upper Nyack.
MASSOLO, M. P., Sales Engr., Johnson Service Co., Long Island City.
MOSS, R. J., Asst. Plant Engr., I. B. M. Advanced Systems Div., Yorktown Heights.
O'HAGAN, D. J., Sales Engr., The Trane Co., New York.
POST, A. E. JR., Industrial Gas Engr., Long Island Lighting Co., Mineola.
SALZMAN, MELVIN, Design Engr., Syska & Hennessy, Inc., New York.
SCHNEIDER, MELVIN,* Mech. Engr., Rose Beaton & Assocs., New York.
SCHARTZ, JOSEF, Mfg. Engr., Carrier Corp., Syracuse.

REGION II

Canada

CHANTAL, MARCEL, Repr., A. P. Green Fire Brick Co. Ltd., Quebec City, Que.
CHING, CHEUNG, Jr. Eng., Circle Refrigeration Ltd., Toronto, Ont.
COGAN, MURRAY, Engr., Air Conditioning Engineering Co., (Canada) Ltd., Montreal, Que.
EMMERSON, W. E., Asst. to Chief Engr., Canadian Ice Machine Co. Ltd., Toronto, Ont.
FERRIS, C. R., Mech. Engr., Canadian Chemical Co. Ltd., Edmonton, Ata.
FRASER, J. S., Sales Repr., Wade in Canada Plbg. Specialties Ltd., Toronto, Ont.
HERSHMAN, HYMAN, Pres., Airco Installations Ltd., Montreal, Que.
JACKSON, L. E., Section Group Leader, Dept. of Public Works, Ottawa, Ont.
JONAS, NEIL, Mech. Engr., Seymour Levine, Montreal, Que.
METZGER, WILLIAM, Sales Mgr., Howe Equipment of Canada Ltd., Montreal, Que.
SLOAN, E. M., Pres., Thermodesign Inc., Montreal, Que.
SMITH, G. E., Sales Engr., Canadian Westinghouse Co. Ltd., Toronto, Ont.
TOPPING, A. P., Sales Engr., Trane Co. of Canada Ltd., Toronto, Ont.

REGION III

District of Columbia

RIS, R. B., Sales Engr., Johnson Service Co., Washington.
WISNIEWSKI, E. J., Sr. Design Engr., General Eng. & Assoc., Washington.

Pennsylvania

KIGHT, L. T., Supvg. Sales & Service, Duquesne Light Co., Pittsburgh.
MILON, W. H., Service & Appli. Engr., Bacharach Industrial Instrument Co., Pittsburgh.
MURPHY, G. E., Chief Engr., Peter F. Loftus Corp., Pittsburgh.
PERRY, F. M., Sales Engr. Johnson Service Co., Camp Hill.
WOZNIAK, ALECK, Design Engr., U. S. Steel Research Center, Monroeville.

Virginia

WRIGHT, S. L., Sales Engr., Johnson Service Co., Norfolk.

REGION IV

Florida

FLETCHALL, G. W., Sales Engr., Illingworth Engineering Co., Jacksonville.
HENNING, F. K., Mech. Engr., Free-Lance, Fort Lauderdale.
LEVENHAGEN, D. R., Sales Mgr., Sunstate Air Conditioning Co., Tampa.

API WANTS MORE RESEARCH, TOO PAGE 78

PILLAT, R. E., Sales Mgr. Typhoon Heat Pump Div., Hupp Corp., Tampa.
SELF, R. G. JR., Sales Engr., Florida Air Conditioning, St. Petersburg.

North Carolina

FERRIOTT, T. L., Mech. Draftsman, Bryan & McDowell, Charlotte.
GORDON, L. H. JR., Sales Engr., Carrier Corp., Charlotte.
LAMB, D. A., Sales Engr., Powers Regulator Co., Charlotte.
TRAVIS, E. A. JR., Sales Engr., Johnson Service Co., Greensboro.
TUCKER, R. W.,† Hgt. & A-C. Repr., Public Service Gas Co., Raleigh.

REGION V

Indiana

DARRENKAMP, B. F., Chief, Htg. Vent. & A-C. Section, Jerome Richardson & Assoc., Loogootee.
SCHIFF, W. J.,* Co-op Engr., Whirlpool Corp., Evansville, Ind.

Ohio

ASHMAN, R. D., JR., Pres., Ric-Wil Inc., Barberton.
AVERY, R. H., Proj. Engr., Samborn Steketee Otis & Evans, Toledo.
BRUNING, R. F., Br. Mgr., Johnson Service Co., Toledo.
CALAFATO, J. S.,* Supv. A-C. Sales, East Ohio Gas Co., Cleveland.
HUNYOR, E. L., Sales Engr., Powers Regulator Co., Cleveland Heights.
MARBLE, A. P., Chief Appl. Engr., Janitrol Heating & Air Conditioning, Columbus.
STAUSS, E. F., Proj. Engr., Ziel-Blossom & Assoc., Cincinnati.
SULLIVAN, R. E., Mfg. Repr., Robert E. Sullivan Co., North Olmsted.
WHITE, M. E., Sales Mgr., Ohio Fuel Gas, Columbus.
WILSON, ROBERT, Mgr., American-Standard, Air Conditioning Div., Elyria.

REGION VI

Illinois

SOLARI, A. J., Designer Chief Engr., Crane Packing Co., Morton Grove.

Iowa

SMITHEY, G. D., Gas Utilization Engr., Iowa Public Service Co., Sioux City.
WHITMAN, W. W., Mech. Inspector, Iowa State University, Ames.

Michigan

SPOONER, A. J. JR.,* Appl. Engr., American-Standard, Ind. Div., Detroit.

Minnesota

FRITZ, W. J., Tech. Sales-"Freon" Products, E. I. duPont de Nemours & Co., Inc., Minneapolis.
HELSETH, E. E., Sales Engr., Vice-Pres., E. J. Baker Co., Inc., Minneapolis.

Wisconsin

O'DONNELL, L. T., Devl. Engr., Controls Co. of America, Milwaukee.

REGION VII

Alabama

HERRING, W. G., Sales Engr., Hairston & Co., Atlanta.
WENSIL, L. R., JR., Sales Repr., Trane Co., Birmingham.

Louisiana

BLANCHARD, E. I., Htg. Consultant, Louisiana Power & Light Co., New Orleans.
GAUDET, J. T., Mech. Engr., Chesson, Forrest & Holland Frank D. Beaullieu, III, Lafayette.
GRAVOIS, R. A., Div. Sales Consultant, Louisiana Power & Light Co., New Orleans.
JONES, R. R., Div. Sales Consultant, Louisiana Power & Light Co., Gretna.

Missouri

CHAMBLIN, GRAHAM, Pres., Industrial Insulations, Inc., Kansas City.

REGION VIII

Texas

ADAMS, D. G., Service & Installation Mgr., Minneapolis-Honeywell Reg. Co., San Antonio.
FRIAS, ROBERT, Cons. Engr., Robert Frias & Assocs., Odessa.
HAWLEY, R. M., Industrial Insulation Sales Engr., Armstrong Contracting & Supply Corp., Dallas.
RUSSELL, S. M., Utilization Engr., So. Union Gas Co., Austin.
SELF, H. D., Sales Engr., Leatherwood Supply Co., Houston.
TAAFFE, G. R., Self Employed, San Antonio.
TANNER, VAN NESS, Appl. Engr., Minneapolis-Honeywell Reg. Co., San Antonio.
WARD, L. B. JR.,* Engr., Strandtmann A-C Co., Austin.

REGION IX

Nebraska

RYAN, W. L.,* Chief Engr., Olson Bros. Inc., Omaha.

Texas

BEAN, W. R., Partner, Wyler Industrial Works, El Paso.

Utah

BROWN, T. R., Mgr., Ted R. Brown Assoc., Salt Lake City.

REGION X

California

BOSWORTH, D. M., A-C. Draftsmen, Lester A. O'Meara, Con. Mech. Engr., Sacramento.
BROWN, L. J.,* Mech. Engr., Bayha, Weir & Finato Inc., San Francisco.
CRUTCHER, W. E., Sales Engr., W. H. Steele Co., Los Angeles.
FARR, R. S.,* Pres., Farr Company, Los Angeles.
GOLDEN, J. F., Sr. Partner, Golden, Bryant & Jehle, El Centro.
KOBAYASHI, B. Y., Mech. Engr., Ralph E Phillips, Inc., Los Angeles.
LOSORWITH, T. J., Self Employed, Fresno.
MCCABE, E. A., Proj. Engr., Scott Co., Oakland.
MCCAFFERTY, R. L., Treas. & Mgr. Contractors Sales, Sharpe Heat & Vent. Inc., Los Angeles.
ROBART, E. A., Vice-Pres., Cooling & Heating Engineers Inc., Los Angeles.
SCHINK, H. C., Self Employed, Bakersfield.
TEEL, D. F., Sales Engr., Thermal Products, Inc., Los Angeles.

Oregon

JARRETT, C. W., Mgr., Public Service, Portland General Electric, Portland.

Washington

GESSER, J. H., Sales Engr., Johnson Service Co., Seattle.

FOREIGN

England

KOMEDERA, MIECZYSLAW.,* Tech. Director, Heat Pump Refrigeration Ltd., Charlton, London.

Germany

DAGAN, ABRAHAM, Refg. & A-C. Engr., AMROP Gmb H & Co. KG, Kirchnerstr.

Netherlands

BORDES, H. J., Chief Mech. Design Engr., N. V. Philips'Gloeilampenfabrieken, Eindhoven.

South Africa

DAMIANOS, GEORGE, Design & Devlpt. Engr., J. L. Clark & Co., Johannesburg.
LUDWIG, O. A., Ventilation Engr., Airco Engineering Ltd., Durban.

Uruguay

CASTILLO, J. F., Pres. J. Felix Castillo S. A., Montevideo.

STUDENTS

BUSCH, H. J., Calif. State Polytechnic College, San Luis Obispo, Calif.
FRANKLIN, D. L., University of Minnesota, Minneapolis, Minn.
WRIGHT, R. C. JR., Purdue University, Lafayette, Ind.

SNOW MELTING SYSTEMS CAN BE NO MORE EFFECTIVE THAN THEY ARE PLANNED TO BE PAGE 71

PARTS AND PRODUCTS

AIR FILTER

Operating on the same principle as the film roll in a camera, the filtering media of this unit, which comes in a roll, unwinds from the top. It passes downward across the face of the air cleaner and, as media is used, is rewound on a bottom spool. Used filter rolls are disposable.

When pressure drop reaches a preset limit, a pressure switch activates a mechanism that advances the media, presenting a clean surface to the air stream at all times. Four models in the V-7 series offer a choice of units either with automatic drive or manual operation.

The V-7 media roll consists of a glass filter material 65 ft in length with a high dust-holding capacity, operating best within a velocity range of 350 to 500 fpm. Individual filter sections may be bolted together in multiples to meet almost any capacity requirement. All models are available in vertical sections in three, four or five-ft widths.

Farr Company, P. O. Box 90187, Airport Station, Los Angeles 45, Calif.

INFRARED HEATER

Producing direct, penetrating warmth, the surface-mounted, 800-watt, 120-volt Quartzheet is cited as reaching top temperature within one min. Circular reflector of the combination heater-lighting fixture is gold-plated for increased heat radiation. Temperature reached by the unit is 1800 F (2.1 micron wave band range).

Unit operates to convert long-wave rays into heat energy, passing through cold air via a fused quartz element with min heat loss. For indoor or outdoor use, applications include bathrooms, guard houses, patios, outdoor restaurants and farm outbuildings.

Infrared Corporation of America, Westbury, N. Y.

TUBE FITTING

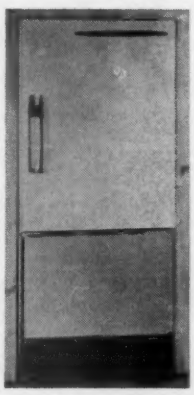
Use of the Swagelok Snubber tube fitting is cited as preventing damage to equipment from sudden flow surges. Providing a dampening effect, the fitting will protect gauges and other instruments from injurious effects of pulsating pressures, and can serve also as a filtering device for liquids and gases, especially in low flow lines.

Fittings are available in all standard tube fitting shapes. The Snubber is offered with Type 316 stainless steel or bronze sintered elements and is readily removable. Sizes range from ⅛ through ⅜ in. OD.

Crawford Fitting Company, 884 E. 140th St., Cleveland 10, Ohio.

1961 REFRIGERATORS

Introduced by this manufacturer for 1961, a nine-model line of electric refrigerators features "no-frost" in five units, as compared with but two in the 1960 line. Swing-out storage shelves in both refrigerator and freezer compartments are now available in the 16-cu ft Mark 61. Other features include a jet-cold meat chest that maintains a constant temperature within 3 F, automatic ice cube supplier without the necessity of filling trays with water, humidity retaining seal on the fruit and vegetable compartment, thermostat for measuring temperature of inside air and jet-cold storage shelves, with cold air forced through ducts built into the shelf and directed onto stored foods.



Whirlpool Corporation, St. Joseph, Mich.

SEPARATORS

Cast-iron steam and oil separators, brass expansion joints and sediment separators have been added to the product line of this manufacturer. Supplementing the present line of high-pressure steel units, low-pressure cast-iron separators are designed for condensate or oil removal where maximum pressures do not exceed 250 psi; units are produced in sizes ranging from 1½ to 8 in. A horizontal 125-psi model is available from 1½ to 12 in. Featured on the 250-psi horizontal unit is a cast-iron drip pocket, serving as a combination collector for both condensate and sediment.

Screwed, semi-guided types designed for installation on steam or hot water heating lines, interior piping, or air, oil or gas service applications, brass expansion joints have maximum working pressures of 125 psi for saturated steam and 200 psi for cold water, oil or gas. Joints are furnished in eight connecting pipe sizes from ½ through 3 in. with standard traverse ranging from 2 to 2¾ in., depending upon joint sizes. A special series with 6-in. traverse is available in sizes from ¾ to 2 in.

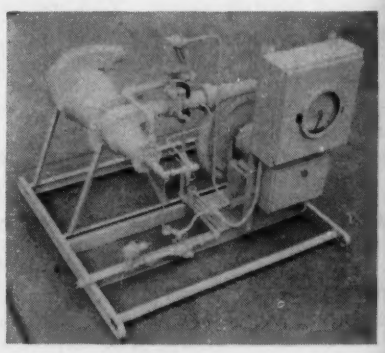
Rounding out the line of Y, basket and angle strainers, the new sediment separators feature narrow, in-line construction and are manufactured in sizes from ½ to 3 in. in both 125 and 250-psi models. Brass screens with either 0.033 or 0.057 in. diam are standard and optional.

Strong Steam Specialties, 508 Sandusky St., Conneaut, Ohio.

AIR HEATER

Basic uses of Q-Pak, a packaged direct-fired air heater, include heating of process air for fluidized bed or spray dryers; direct heating of furnaces, ovens, dryers or kilns; indirect heating of process fluids; multi-heater temperature zone control on continuous dryers or kilns; packaged waste disposal units; and packaged multi-stage chemical reactors. Where extremely high efficiencies and inert atmospheres are required, the unit may be incorporated in flue gas recirculation heating systems.

A major feature of the heater is a Uniflux Fuel Reactor, a high intensity mixer in which combustion air is brought tangentially into an annular space around a combustion chamber, producing a cooling effect and enabling the fuel reactor to be constructed entirely of metal. Vortex created inside the reactor causes rapid recirculation and mixing of the reacting combustibles and combustion air, which results in essentially complete combustion within the primary reactor.



Inert products of combustion leave

(*Continued on page* 100)

IMPORTANT ANNOUNCEMENT

to people who hear voices*

*voices that intrude or disrupt and noises that project when they should be hushed.

The new Aircoustat® Model W Return Air-Vent Silencers stop the transmission of noise without blocking air flow

Aircoustat Return Air-Vent Silencers eliminate the distracting sound of voices that spill from one area to another. Their slim design gives you a choice of installation. You can install them within a wall or ceiling or hang them on doors or walls. Let Koppers long experience in sound control help you. Write today for information to: KOPPERS COMPANY, INC., 3501 Scott Street, Baltimore 3, Maryland.

Model W Return Air-Vent Silencer

In sizes for all applications:

Model	Thickness	Width	Length
W-1	3½"	30"	48"
W-2	3½"	42"	48"
W-3	5"	30"	48"
W-4	5"	42"	48"
W-5	7"	30"	48"
W-6	7"	42"	48"

KOPPERS

SOUND CONTROL

METAL PRODUCTS DIVISION

® *Engineered* Products Sold with *Service*

Philadelphia's Second Heating Seminar

CHARLES H. LOGAN
Presidential Member
ASHRAE
Moderator

Second of the annual, all-day Heating Seminars of the ASHRAE Philadelphia Chapter was held at the University of Pennsylvania November 19, 1960. The planning of the first Seminar was reported upon in the October 1959 issue of the JOURNAL as "How Diversified Seminar Programs Benefit Our Philadelphia Chapter."

Our purpose is to provide practical information on air conditioning, refrigeration and heating to young engineers, contractors, and others specializing in related fields of engineering who wish to be informed on subjects which are uncommon in their everyday work. The speakers selected by the Technical Committee are generally men with considerable experience in their fields, capable of making a presentation on a practical level aimed mainly at non-members of ASHRAE.

Preparations for the November Seminar started as early as June of this year when the auditorium was contracted for and arrangements were made to provide a public address system, movie and slide projectors for various size slides, lunch for the audience and speakers, parking space and advance publicity in the local trade and commercial magazines.

Otto J. Nussbaum is Chairman of the Technical Committee of the ASHRAE Philadelphia Chapter.

OTTO J. NUSSBAUM

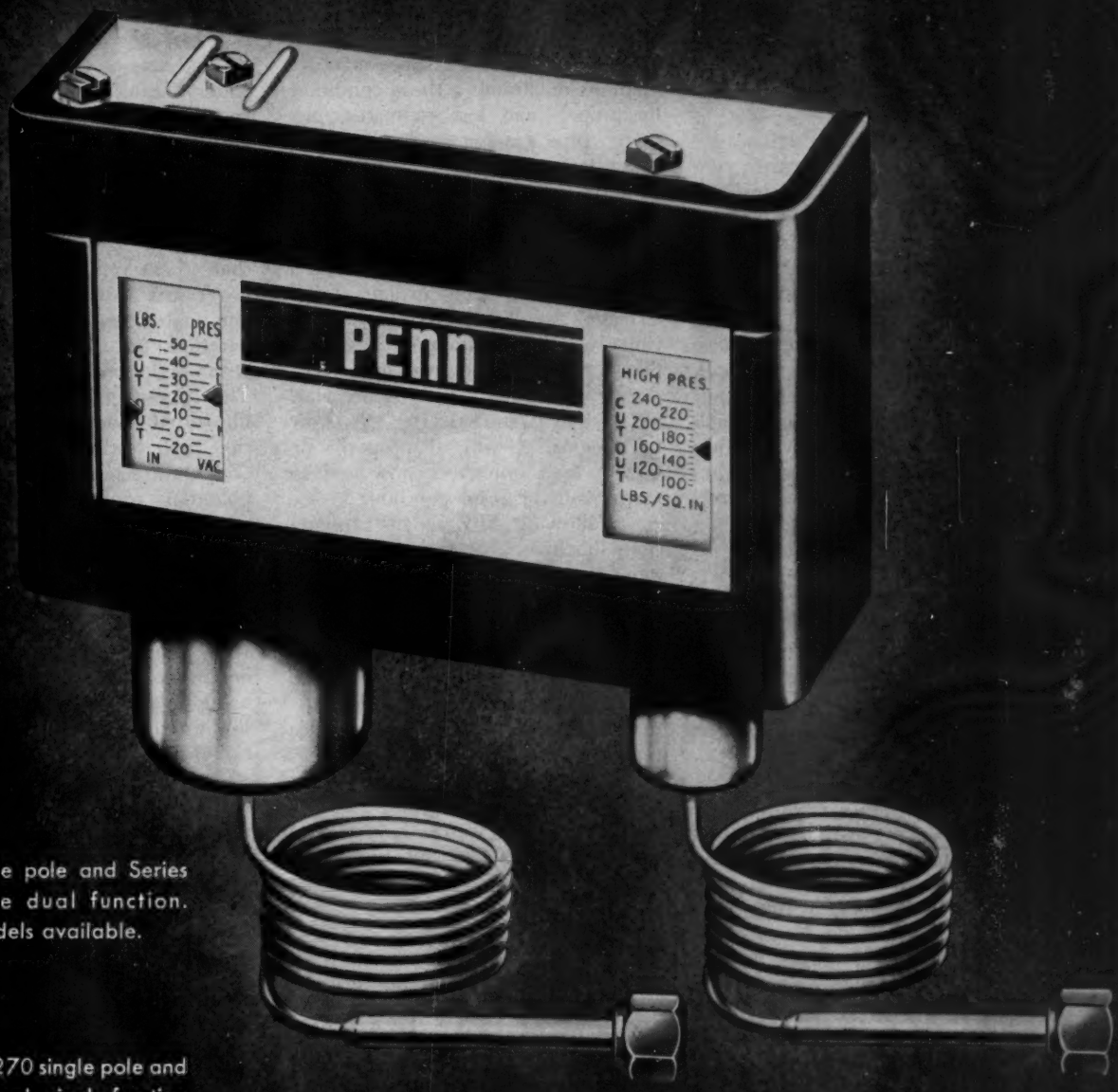
A committee of six active chapter members attended to details and secured qualified speakers. The first committee meeting took place in September and a tentative schedule of topics and speakers was agreed on. The price of tickets was established and a vigorous promotion campaign was initiated. A second meeting with the participation of the speakers and the moderator was held in October to acquaint the panel members with each other and with the procedure and rules of the Seminar. The speakers had an opportunity to compare their presentations and to eliminate overlapping topics.

Attended by approximately 200 individuals, approximately half of whom had made advance ticket reservations, the meeting was welcomed by Bill Mullin, Chairman of the Philadelphia Chapter. Attending were ASHRAE Second Vice President John Everetts, Jr., and Regional Director Earle Wagner. Mr. Mullin briefly outlined the aims of the Society, described its publications, and extended an invitation to those interested to inspect a foyer display of Society publications.

As Moderator, ASHRAE Presidential Member and Past Chairman of the Philadelphia Chapter Charles R. Logan, acquainted the speakers and the audience with the time table and the rules of the Seminar. Questions from the floor were to be reported on cards and passed to the Moderator who would read them over the public address system so that the entire audience could understand each question and answer clearly. Any of the panel members could be addressed after each presentation and all panel members remained seated on the stage for the entire duration of the Seminar. Each presentation was to last from 35 to 45 min, followed by a 10 to 15 min question period and a five min intermission.

The first paper, by Arthur T. Spangler of Carrier Corporation, described "High Pressure Air Distribution Systems for Heating and Air Conditioning" and reviewed some of the original installations of high pressure ducting. The basic experiences gained from these projects are now applied to numerous installations in existing and new structures. He devoted considerable time to duct design and load calculations and recommended a reduction of the customary figure of 400 cfm/ton. He described

At Philadelphia's Second Seminar, ASHRAE Presidential Member Charles R. Logan (above) was Moderator. Speakers included E. Shequine, Harry King, A. Spangler, A. Spillman and R. Ruzicka.



Series 271 single pole and Series 1273 two pole dual function. Temperature models available.

Below . . . Series 270 single pole and Series 1272 two pole single function for either low or high pressure. Also temperature models.

YOU CAN DO MORE JOBS WITH LESS CONTROL INVENTORY!

Penn's line of refrigeration controls has the capacity and versatility to satisfy all cooling requirements! Single or double pole models are available for all types of applications and are rated to handle single or polyphase motors from 1 through 5 H.P. capacity!

And, you get real economy, too. The two pole heavy duty models eliminate the need for motor starters when used on polyphase motors with built-in overload protectors. With their two separate circuits, these models are really 2 switches in 1. Don't settle for less . . . ask your wholesaler for Penn Controls!

PENN CONTROLS, INC. Goshen, Indiana

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AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

the advantages of high pressure ducting and called attention to the need for more accurate load estimates and a new load calculation method, which takes into account heat storage of structures.

Arnold D. Spillman, Engineer for Philadelphia Electric Company, described certain heat pump installations in the local area. He called attention to the high heat input due to electric lights and appliances which prevails in many commercial and industrial structures and must be taken into account in calculating heating loads. He has encountered as much as 10 to 15 watt/sq ft of heat input due to lighting and appliances which radically cuts the necessary heating capacity. For year-round heat pump operation, Mr. Spillman recommends that the ratio of heating to cooling load must be 1.0 or less in order to result in economical heat pump operation. Mr. Spillman briefly reviewed heat pump installations in the Northern United States which he has supervised and found to operate economically. He also gave a brief review of electricity rates in the Philadelphia area.

Harry K. King, Field Engineer, A. M. Byers Company, took "A Second Look at Radiant Heating and Snow Melting." Mr. King, a veteran in the heating business, became associated with the radiant heating field about 20 to 25 years ago. He reported that introduction of radiant heating was originally prompted by two main motives, namely to develop a new type of "wet heating" system and to create a new market for small diameter wrought iron pipe. He discussed in detail the prerequisites for human comfort in a heated space and the methods of attaining these conditions by proper heat loss estimates, pipe sizing, pipe spacing, and selection of water temperature. Mr. King's presentation was augmented by a moving picture on snow melting by way of underground wrought iron pipes in which a warm anti-freeze solution is circulated. Mr. King explained that if water circulation is started in advance of a snowfall, snow accumulation in the protected area can be completely prevented. If the snow melting system is started after the snowfall begins, it will, if properly designed, melt impacted snow and ice at the rate of 1 in. per hour.

Following Mr. King's presentation, luncheon was served in an adjoining room and the Seminar was resumed thereafter when Earl R. Shequine of Combustion Engineering, Inc., discussed high temperature water heating systems and boilers designed for such systems. He stated that this medium becomes economical for heating systems starting with 2 to 4 million Btu/hr. Operating pressures are from 100 to 300 psig permitting supply water temperatures from 320 to 420 F. Such high water temperatures offer economies because of reduced water flow rate, smaller pipe sizes and lower pumping costs. The size of the heat transfer units using high temperature hot water is considerably less than that of conventional units, because of the greatly increased temperature difference between heating medium and the air.

Mr. Shequine also reported increased use of high temperature hot water because it offers numerous advantages in operation when compared with high pressure steam, particularly reduced vent losses, less pipe corrosion, simplified feed water treatment, simplicity of piping, and large thermal storage capacity. He claimed that these advantages resulted in lower first cost, and lower operating and maintenance costs of high temperature hot water in comparison with high pressure steam systems. This discussion concluded with an illustrated review of the design, selection, and testing of boilers for high temperature hot water, and also their potential application for absorption refrigeration systems.

Robert Ruzicka of J. V. Calhoun Company provided a color movie illustrating the advantages of residential baseboard heating in comparison with other methods of residential heating. He emphasized the specific advantages of this method as being low first cost (for both new construction or remodeling), ease of control and maintenance of individual room temperatures, cleanliness, space saving and simplicity of repair and maintenance.

At the Seminar numerous questions were asked by the participants and literature requests were transmitted to the speakers by the moderator. It was announced that the coming Refrigeration Seminar would be held at the same location in March.

IT'S YOUR PROGRAM

(*Continued from page* 29)

ent Program Committee Chairman had been an active Society member for over ten years yet knew very little about our Research Program, he suspected there were many others nearly as uninformed on the subject as he. This promises to be a revealing, interesting session on five basic subjects:

ASHRAE Research Program.

How new Projects are initiated.

Cooperative Research Programs.

Benefits of ASHRAE Research to Industry and the Engineering Profession.

These Symposiums, and the additional ones you may wish to organize, can be valued meeting places for the technical information you need, to advance yourself, your company and your profession. Give it some thought, make some investigations, contact your Program Chairman or Headquarters for assistance in getting your group organized.

Technical Sessions – The Forums and Symposiums deal primarily with current practical, technical and activities progress.

Research results are reported at National Meetings through the presentation of Technical Papers at Technical Sessions. These papers have come to the Program Committee by voluntary contribution from members, as a result of ASHRAE sponsored research or by Program Committee solicitation.

These sources have not produced completely satisfactory results. By the time the reviewers, usually members of a Technical Committee or Research Committee, have made their criticisms, there may not be enough good papers left for three or four good Technical Sessions of three to four papers each.

We need at least 35 good Technical Papers for each National Meeting Program to enable us to select 12 to 16 of the best to fit together in 3 or 4 sessions. The remainder might either be published, as of timely interest, in the JOURNAL or held for use at a succeeding Meeting.

How are we going to secure these good **Technical Papers?**

We know that there are reams of technical data available in members' company files that have never

"I'm an 'expert' on AIR CONDITIONING"

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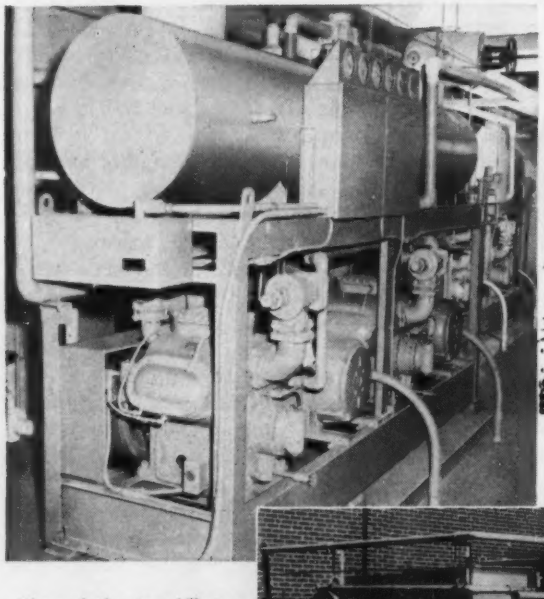
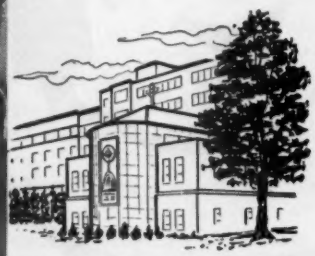
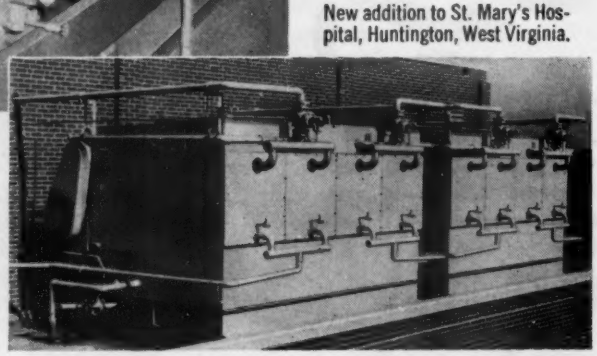
With Vilter air conditioning... it's almost a pleasure to be a patient here



View of the two Vilter packaged water chilling units arranged as four independent refrigeration systems. Two Vilter VMC compressors are included in each chiller unit.



New addition to St. Mary's Hospital, Huntington, West Virginia.



View of the two Vilter evaporative condensers, one for each packaged unit. Each condenser is divided into two separate sections to efficiently reduce capacity when required.

Efficient, flexible, quiet—the Vilter installation for the new addition at St. Mary's Hospital provides everything a hospital requires of an air conditioning system.

This system is designed around two separate Vilter Refrigerant 22 packaged water chilling units arranged as four independent systems supplying a total of 300 tons of refrigeration.

The performance advantages are — (a) an exceptionally flexible operating plant because of the four systems and the 33% and 66% capacity modulation built into each compressor; (b) lower starting and operating noise levels as a result of dividing the full load and using modern slow speed equipment; (c) maximum insurance against failure; (d) ease of servicing.

Four Vilter VMC compressors, V-belt driven from 75 H.P. motors, individually develop 76 tons as each water chiller cools 440 gpm from 53° F. to 45° F. with a 35° F. refrigerant temperature. Two Vilter evaporative condensers are utilized with each condenser divided by a baffle to actually provide four separate 100-ton units.

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Architect, Vecellio & Kreps; Consulting Engineer, L. O. Johnson; Mechanical Contractor, Dougherty Company, Inc.

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been put into technical paper form for presentation to the Society members. Some of these important data stay buried because of lack of time to prepare a paper for publication, because some of it is considered secret, because of inertia or because of ignorance of the interest of other members of its value toward the furthering of technical advances.

We believe that increased activities in Forums, greater participation in organized interest groups and resultant Symposiums, and continuing reports on sponsored research will make it clearer to the custodians of these valuable data, that presentation in proper form will further the art or science in which they are interested. In addition, it will bring valuable returns in the form of comments from qualified reviewers and other correspondents after the paper is published.

The Program Committee has asked for assistance to secure Technical Papers through the Technical Committees. We understand that

WHO'S WHO IN ASHRAE

Insofar as possible these listings will each appear twice a year

ASHRAE OFFICERS, DIRECTORS, COMMITTEES, STAFF
See page 88, December JOURNAL

REGION AND CHAPTER OFFICERS
See page 82, November JOURNAL

RESEARCH AND TECHNICAL COMMITTEES
See page 67, September JOURNAL

STANDARDS PROJECTS
See page 74, this issue

INTER SOCIETY COMMITTEES
See page 84, November JOURNAL

CHAPTER PUBLICATIONS AND THEIR EDITORS
See page 72, December JOURNAL

there are 57 of them covering all phases of heating, refrigerating, and air conditioning engineering. We have asked the Technical Committees to solicit papers within their areas of interest. We'd like to see at least one paper from each of the 57 Technical Committees every year. Can it be done? We think so!

Technical papers have values beyond advancing the science itself for they offer a means of gaining recognition for you and your company, university or other employer. This is commercial value and important to the advancement of ourselves, our employers, our Society, and our country.

If you have information that needs to be shared with others, someone may "needle" you to present it; but don't wait for that, "needle" yourself.

Your Program Committee Chairman has been a member of that committee for several years. He expects to retire from this activity in June and thanks to a fine Program Committee and your interests in suggesting improvements to the ASHRAE officers, he believes the long range plans for good programs is better than it ever has been. You'll prove him right by your continued interest and **PARTICIPATION.**

P. S. — If you still want to observe, that's O.K. too. These participants need an audience.

BURNER PULSATIONS

(*Continued from page* 53)

thereof) the wavelength of the principal frequency of pulsation, and when the heating unit is in proper location within the room. The only practical solutions to the problem of room acoustics appear to be to change the location of the heating unit, to use auxiliary walls or baffles to change the natural room frequency, or to replace the furnace by one with a different frequency. Proper location for auxiliary wall or the heating unit has been suggested.[18] Acoustic treating material, such as fibrous materials, are not effective noise suppressors for the low frequencies involved in residential oil-fired heating units.

These conclusions are made relating to pulsation suppression

SPECIAL FEATURE

"INSULATED TILT-UP CONSTRUCTION"

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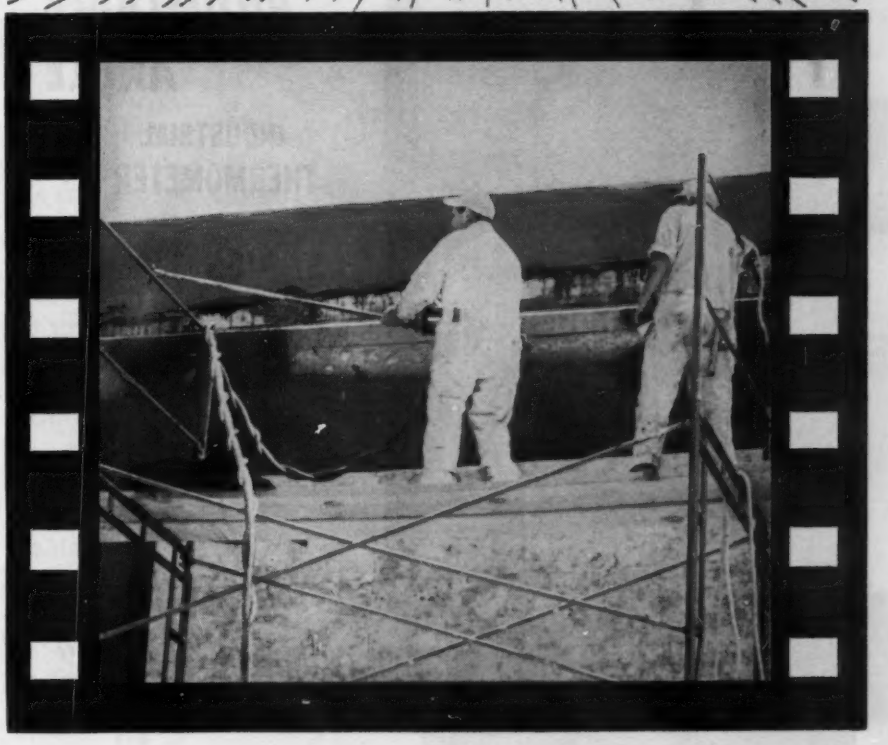

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6. Press blanket-type insulation into place.

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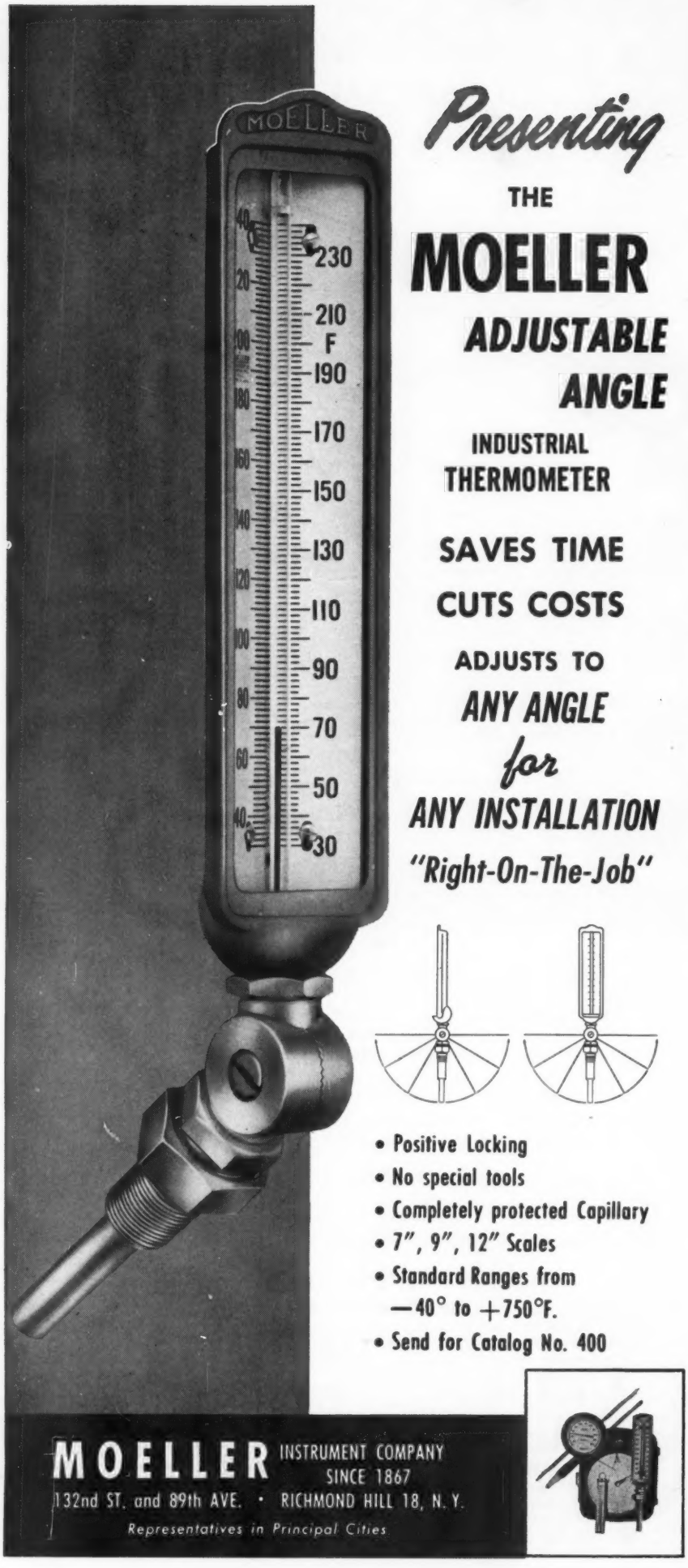

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techniques for oil-fired residential heating equipment:

1. Venting appears to be an attractive "quick-fix" type technique which can be applied to most heating units. Possible escape of smoke, odor, flame, and random combustion noise from the vent must be considered in any design, and thus, may represent a drawback to this technique in some cases.

2. The value of nozzle changing can be enhanced, if systematic studies are made of a given furnace-burner unit, in order to delineate the regions of pulsation, as has been shown in Fig. 2.

3. A promising technique for suppressing pulsations is air-pattern modification. However, extensive information would be needed to provide basically applicable information. If better control of the air pattern were possible, other combustion aspects than pulsation control could also be benefited.

4. The air-handling system of gun-type burners can be made more stable by incorporating a high pressure drop across the choke, producing a fine scale turbulence, and by using a fan with a performance curve more suitable for oil-burner application.

5. Controlled recirculation appears to have a beneficial effect in suppressing generation of combustion noise and pulsation.

6. Use of flameholders appears to have great promise for control of pulsation, if they can be made inexpensively, and if they can be designed to minimize deposit problems.

7. Suppressing pulsations by using acoustic filters or by increasing the frequency of acoustic pressure oscillations does not appear to be practical for oil-fired residential heating units.

ACKNOWLEDGMENT

The able assistance of members of the Pulsation Research Steering Committee of the ASHAE Technical Advisory Committee on Combustion in guiding the research

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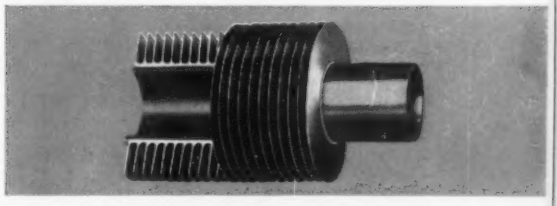

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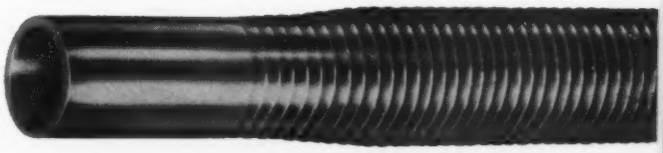

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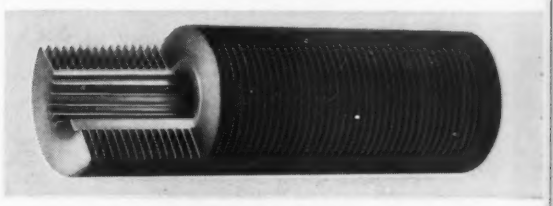

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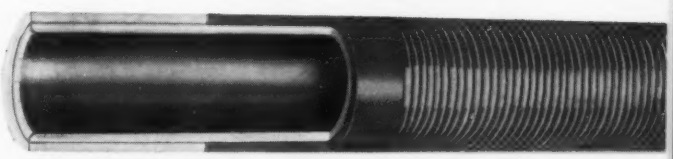

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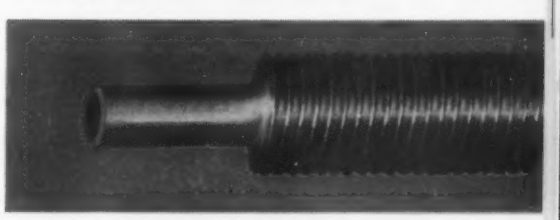

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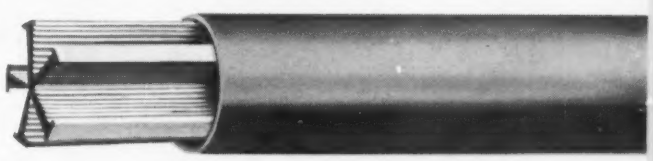

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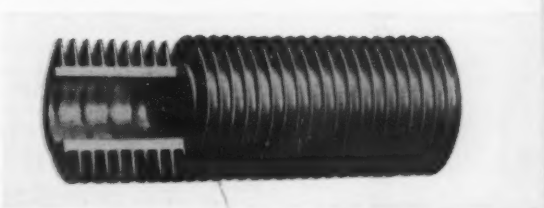

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and in providing necessary information and materials is gratefully acknowledged.

REFERENCES

1. Putnam, A. A. and Speich, C. F., "Combustion-Driven Pulsations in Oil-Fired Residential Heating Equipment", to be published.

2. Sanders, G. J. and Lawrie, W. E., "Low Frequency Combustion Noise in Oil-Burning Equipment", Heating, Piping and Air Conditioning, Vol. 30 (10), p 127, October, 1958, and *ASHRAE Transactions*, Vol. 65, p 181, 1959.

3. Anonymous, "To Reduce Pulsations", Fuel Oil Journal-Oil Heating and Air Conditioning, Vol. 18 (10), p 16, April, 1940.

4. Glendenning, E. B., "Shell Anti-Pulsator", Report No. PAL-107, Shell Oil Company, Sewaren, N. J., June 10, 1948.

5. Weeks, R. L., Clinkerbead, W. C., and Soltis, J. O., "To Modernize the Old Installation", Fuel Oil News, Vol. 25 (2), p 22, February, 1960.

6. Sage, R. W. and Schroeder, H. F., "Noise Suppression in Oil Burners", ASHRAE Journal, Vol 2 (10), p 53, October 1960.

7. Faust, F. H. and Kaufman, G. T., Handbook of Oil Burning, Oil Institute of America, p 459, 1951.

8. Putnam, A. A. and Dennis, W. R., "Suppression of Burner Oscillations by Acoustic Dampers", ASME Transactions, p 875, 1955.

9. Olson, E. O., "Application of Fuel Nozzles in High-Pressure Domestic Oil Burners", presented at the Third Symposium of the Technical Division, Seattle, Washington, Oil-Heat Institute of America, Inc., April 30, 1959.

10. Putnam, A. A. and Dennis, W. R., "Pulsations in Residential Heating Equipment", ASHAE Transactions, Research Report No. 1596, Vol. 63, p 153, 1957.

11. Dennis, R. L., "Pulsation and Compression Factors", Fuel Oil News, Vol. 20 (12), p 16, December, 1955.

12. Putnam, A. A., Dennis, W. R., and Landry, B. A., "Final Report from Battelle to U. S. Radiator Corporation, June 20, 1952.

13. Baker, J. O., "Determination of the Pulsating Characteristics of High-Pressure Oil Burners", Masters Thesis to Iowa State College, 1941.

14. Sullivan, W. A. and Ventres, L. H., "A New Combustion Process", Fuel Oil News, Vol. 24 (6), p 33, June, 1959.

15. Banscher, F., "Burner for Liquid Fuel", U. S. Patent No. 2646109, July 21, 1953.

16. Cambel, A. B., "A Review of Flame Stabilization by Means of Gaseous Jets", Combustion and Propulsion — Third AGARD Colloquium, Pergamon Press, p 541, 1958.

17. Speich, C. F., Dennis, W. R., and Putnam, A. A., "Acoustic Coupling of Residential Furnaces With Their Surroundings", ASHAE Transactions, Research Report No. 1612, Vol. 63, p 413, 1957.

NEW PRODUCTS

(*Continued from page* 90)

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Available sizes range from 100,000 to 10,000,000 Btu/hr heat release. Only fuel and electrical supply hookups are required on the delivered unit. Safety features include air purge, flame failure safeguards and continuous pilot with electric spark ignition.

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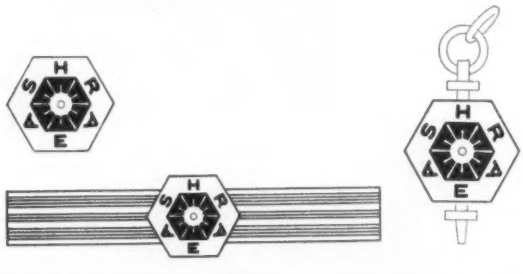

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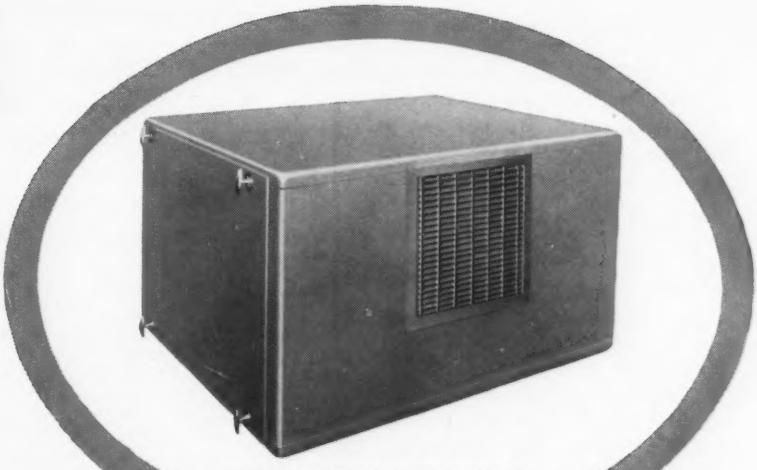

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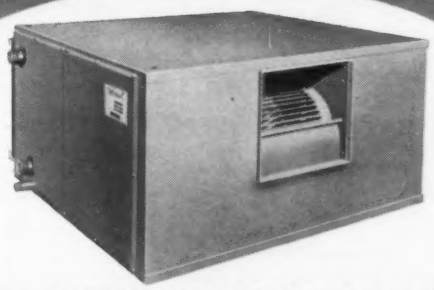

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slowly meter it into the suction line in small, tolerable amounts which can be re-evaporated. Strainer and metering tube are removable easily, and a gravity oil drain is cited as preventing oil trapping in the accumulator. Control of liquid is positive by use of a calibrated metering tube during defrost.

Preventing compressor overloading during initial pulldown, defrost and at the start of the refrigeration cycle is a holdback valve. Low temperature compressors can be used with standard electrical protection. Evaporator has an all-copper drain pan with copper heating coil soldered to the pan and protected by the outer aluminum casing.

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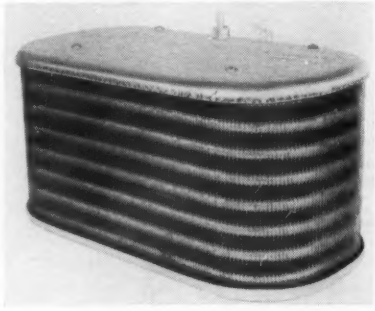

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CHAIRMAN KROEKER

(*Continued from page 56*)

for the industry.

Accordingly, the Long Range Planning Committee recommends that the Society:

Continue a vigorous research program.

Discontinue the Society laboratory at Cleveland and dispose of it as soon as is practicable.

Conduct and sponsor research at universities and other established laboratories.

Use Society general funds for Society administration of the research program and the publication of research; and

Use a Society Research Fund to finance research work through grants to universities and contracts with private laboratories. This Fund would include the present Research Fund, future contributions to the research program, and investment income from the present research reserve funds and from the proceeds of the present research assets.

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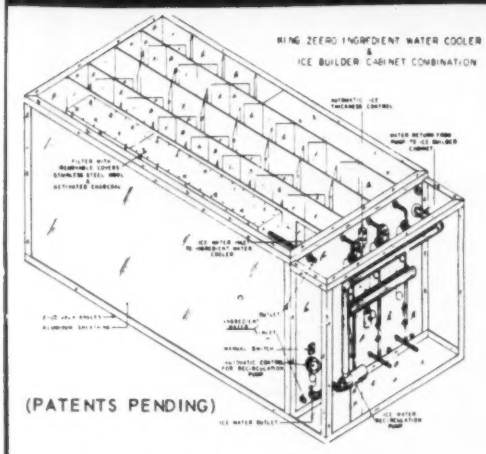

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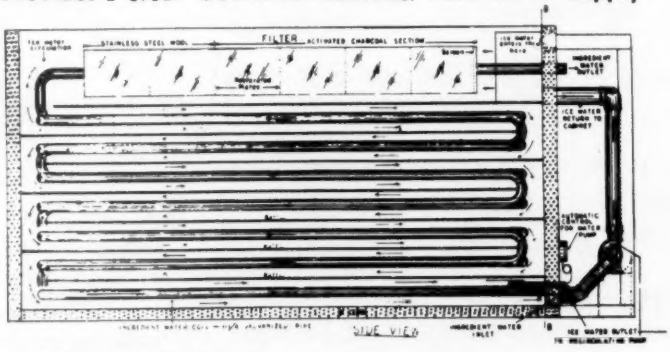


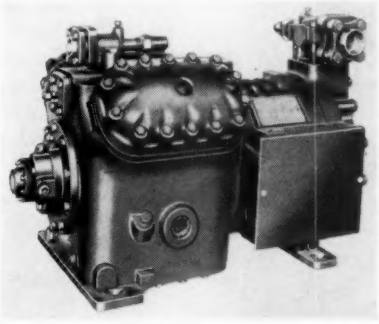
The KING ZEERO Pure Water Cooler consists of a galvanized pipe water coil, a self contained efficient charcoal filter, a KING ZEERO Ice Builder and an ice water recirculation pump, with controls and necessary valves for flow and back wash, all contained in an integral unit.

THE KING ZEERO COMPANY 4300-14 W. Montrose Ave. Chicago 41, Ill.

Manufacturers of Ice Builders - Ice Builder Cabinets - Ice Banks Pure Water Coolers

BULLETINS AND CATALOGS

Motor Compressors. Two four-page bulletins, covering specifications and performance data on new four and



six-cylinder Copelametic motor-compressors, describe and illustrate the units and present data on both low and high temperature ranges. These new models extend the hp range of low temperature applications from 5 to 7½ and 10 hp and the high temperature range is increased from 10 to 30 hp. Bulletin 6001 is descriptive of 7½, 10 and 20-hp models, 6006 of 10, 20 and 30-hp units.
Copeland Refrigeration Corporation, Sidney, Ohio.

Steam Heating Coils. Complete with photographs and drawings, and containing sections on construction details, selection, performance, piping diagrams and installation procedures, 24-page Catalog 1710 includes application information on blast heating, distributing tube heating and dual feed distributing tube coils. Described in the bulletin are the wide range of sizes and capacities available.
Westinghouse Electric Corporation, Sturtevant Div, Hyde Park, Mass.

Heat Exchangers. Construction details and engineering data, as well as selection charts for all types of converters and instantaneous heaters, both steam-to-water and water-to-water heat transfer, are provided in 24-page Catalog No. 601. Tables included are on design ratings, materials specifications, Btu and steam requirements and fouling factors.
Old Dominion Iron & Steel Corporation, Belle Isle, Richmond 3, Va.

Smoke Recorders. Null-balance potentiometers with rapid traverse and adjustable sensitivity, these smoke recorders may be installed on either new or old boilers. Adjustable sensitivity of the instruments may be set to cover a desired range of a smoke spectrum. If complete coverage from clear to blackout is desired, this covers the entire chart graduated from zero to 100. Bulletin 592.
Photomation, Inc., 96 S. Washington Ave., Bergenfield, N. J.

Copper Tube Handbook. Detailing lines of copper water tube, Types K, L and M; copper drainage tube, DWV; copper and red brass pipe; threadless copper pipe, TP; and copper refrigeration tube, this 32-page bulletin is directed at the plumbing, heating, air conditioning and refrigeration industries. Included are comprehensive technical and installation data with guides to selection of correct sizes and types of tube and pipe, as well as soldering, brazing and flared joint information.
Scovill Manufacturing Company, Waterbury, Conn.

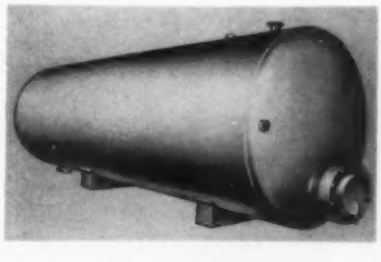
Baseboard Radiation. Utilized in this baseboard are non-ferrous heating elements composed of aluminum fins firmly bonded to ¾-in. copper tubing. Flyer 13D describes and illustrates the product, presents design suggestions and piping and wiring arrangements and tabulates ratings.
Hydrotherm, Inc., Northvale, N. J.

Temperature Control. Flyer 109 gives an extensive description of indicating differential expansion-type temperature control Model LD-1S, for electric operation. Indication is with an independent dial thermometer incorporated in the tube assembly. Included in the unit is a snap-action small travel switch. Product photographs, description of operation and table of standard ranges, tube sizes and performance are presented in the bulletin.
Burling Instrument Company, 16 River Rd., Chatham, N. J.

Felts. Felt may be manufactured in a variety of forms for a wide range of applications. Among those listed in this eight-page applications guide are absorptive felts with a wicking action that enables them to store, filter, circulate and deliver specified controlled amounts of liquids; Vibra-Mount felt pads for vibration isolation; felt for spacing, surfacing and padding, such as in holding component parts at fixed distances from one another; cushioning and packaging; controlled hardness and texture to produce a desired degree of abrasiveness for polishing the roughness and irregularities from a wide variety of materials; mechanical seal applications; pulling strip metals through cleaning and drying operations; shock-absorbing; filtration; and thermal and acoustic insulation.
American Felt Company, 113 Glenville Rd., Glenville, Conn.

Ventilation Equipment. Of the nine items described in four-page Bulletin 39M-7-60 five were introduced this year. Included is information on ventilator-skylights, centrifugal and axial belt-drive roof exhausters, centrifugal and axial direct-drive roof exhausters, centrifugal direct-drive wall exhausters, high discharge units and a sound control curb.
Jenn-Air Products Company, Inc., 1102 Stadium Dr., Indianapolis 7, Indiana.

Storage Water Heaters. Introducing a new line of storage water heaters is eight-page Bulletin 61, which describes ASME construction of tanks and elements, alloys available for special fabrications and various clads and linings available to extend tank life. Extensive specifications cover 55 sizes



in both vertical and horizontal models plus 114 sizes of removable U-tube heating elements. Contained in a special section is a fast method for selecting the correct tank and heating element sizes.
Niagara Weldments, Inc., 55 Portage Rd., Niagara Falls, N. Y.

Circulator. Introduced in four-page Bulletin F-1000 is a new circulator, featuring quiet performance, unitized construction, compact design, dynamically-balanced motor and a pump which requires no lubrication during the first operating year.

Also described in the folder are a two-way flow check valve, combination air eliminator with flow check, combination tank drain, radiator diversion fittings, feed water pressure regulator, safety relief valve, low water cut-off and tempering valves.
Watts Regulator Company, P. O. Box 810, Lawrence, Mass.

Welding Thermoplastics. Operating and maintenance instruction for welding thermoplastics such as polyethylene, polypropylene, rigid and plasticized PVC and plasticized tank linings are contained in four-page Manual 60-2. Included are general description, installation procedure, operating instructions (preparation of material, tacking operation and hand, medium and high speed welding with round rod and plasticized strip), warranty and application drawings.

Kamlar Products Company, 932R Washington St., Norwood, Mass.

Water Heaters. Four flyers present product illustrations, descriptions and specifications for this manufacturer's lines of glass-lined electric water heaters. Flyer 9-60-40B covers the Bantam line, available in 3, 6, 12 and 18 gal sizes in round and square types; Imperial heaters in capacities from 3 to 103 gal are the subject of 7-60-25R; tabletop heaters in 30, 40 and 50 gal sizes are described in 9-60-20T; and 9-60-40LB provides information on the Lo-Boy series.

Teter, Inc., 13901 S. Indiana Ave., Chicago 27, Ill.

Rotary Cooler. For commercial and industrial applications, this redesigned rotary evaporative cooler, discussed in four-page Bulletin B-1100-1F, features bronze disc screen rotor, sealed electric gear motor drive and automatic external flush valve. Dimensional and weight data, product illustrations and information on motor and fan are presented in the bulletin.

Farr Company, P. O. Box 90187, Airport Station, Los Angeles 45, Calif.

Roof Ventilator. Extensive data on new high-speed, high-capacity, "Up-Blast" vertical exhaust roof ventilator Type UB are presented in Bulletin DB3-300. Designed for industrial and commercial use, the fan is described according to engineering and specification data for all available sizes. Construction features give details of the ventilator's housing, motor, fan wheel, weather damper, inlet, drive and fire damper. Charts provide information on performance, sound level classification, gauges of steel and dimensions of various models.

Ilg Electric Ventilating Company, 2850 N. Pulaski Rd., Chicago 41, Ill.

Thermal Insulation. Reproduced for reference purposes, this 27-page master specification for thermal insulation was developed by a mechanical engineering firm specializing in commercial work. Modern trends to fire-retardant materials for interior systems have been incorporated and the number of different basic insulation products and accessories has been minimized.

Insul-Coustic Corporation, 42-23 54th Rd., Maspeth 78, N. Y.

Airflow Control. Drafstop combines the advantages of conventional back draft dampers without having their disadvantages. Synthetic rubber-coated nylon fabric assures quiet operation, with fabric blades closing against a wire grille to form a tight seal, preventing back drafts yet allowing large free area when open.

Features are cited in a four-page bulletin which illustrates the product and discusses specifications.

Airflow Controls Company, 621 W. Lake St., Minneapolis 8, Minn.

Spiral Pipe and Fittings. Tabular information in this eight-page bulletin gives comparisons of duct construction for high velocity systems; diam, weight, gage and strength properties of spiral pipe; and attenuation per ft for sound absorbers. Fittings are diagrammed and advantages of spiral pipe for application in high velocity systems are enumerated.

United Sheet Metal Company, Inc., 540 S. Drexel Ave., Columbus 9, Ohio.

Centrifugal Pump. Only moving part on the Magnaflow pump, the rotor-impeller, is directly driven – not mechanically but magnetically like an electric motor. Stator windings carrying the electrical currents causing the rotor-impeller to spin are outside in a sleeve which retains the pumped liquid in a closed system.

Detailing information about the pump is four-page Bulletin M60. Capacities are presented graphically.

Corley Company, Inc., 685 Myrtle Ave., Boonton, N. J.

Plastics Ductwork. Corrosion-proof plastics ductwork is offered in five different materials to serve in a variety of applications. Descriptive of these materials and their properties is four-page Bulletin 16.

Permanite is a thermosetting furan resin glass fiber laminate, with resistance to acids, alkalies, solvents and chlorinated products. Lightweight and strong, it will withstand temperatures to 350 F.

Chemical resistance of Resibond, a polyester resin glass fiber laminate, suits it for strong acid services. Lightweight and fire retardant, it can withstand temperatures to 200 F.

Available in round and rectangular sections, Epiloc is an epoxy resin glass fiber laminate with high chemical resistance to strong acids. High physical strength and ability to withstand temperatures in excess of 350 F are cited for the product.

Knight-Ware is an acid-proof ceramic material, able to withstand temperatures to 2000 F.

Polyvinyl chloride plastics, designated PVC, are made into ductwork by fabricating from sheets. Ease of fabrication as well as superior chemical resistance to acids and alkalies suit it for use as ducts and hoods in plating and metal treating shops. Temperature limitation of the material is 160 F.

Maurice A. Knight Company, Akron 9, Ohio.

Underground Pipe Insulation. A dry, granulated, resinous hydrocarbon of petroleum origin, Witcolite is suited particularly for thermal insulation of hot or cold permanent underground pipes. Installation consists in packaging the granules around the pipes. Application of heat through the pipes forms an adhesive thermoplastics structure with high thermal insulation values and resistance to moisture and corrosion.

Included in five-page Bulletin W-22 are data on physical properties of various grades of the material, reference tables for determining the grade required and amount needed to meet different operational specifications and recommended installation instructions.

Witco Chemical Company, Inc., 122 E. 42nd St., New York 17, N. Y.

Selection Guide. "Six Step Manual for Sizing Cooling Tower Pumps and Piping,", an eight-page booklet illustrated with diagrams and charts, is offered as a convenience to the designer to aid in selection of a pump that will afford minimum installation and operating cost, yet assure proper circulation for the entire system.

Charts illustrating the capacities in gpm of Series 1522 and 1531 pumps are included, as well as tables showing total equivalent pipe footage for different pump pressure heads and carrying capacities of various pipe sizes in gpm.

Bell & Gossett Company, Morton Grove, Ill.

Flexible Metal Hose Assemblies. Pump vibration is absorbed, water hammer noises are reduced greatly and normal expansion and contraction problems are eliminated with use of flexible hose assemblies. Applications cited include floor joists, convectors, hot water tanks, baseboard, to remove

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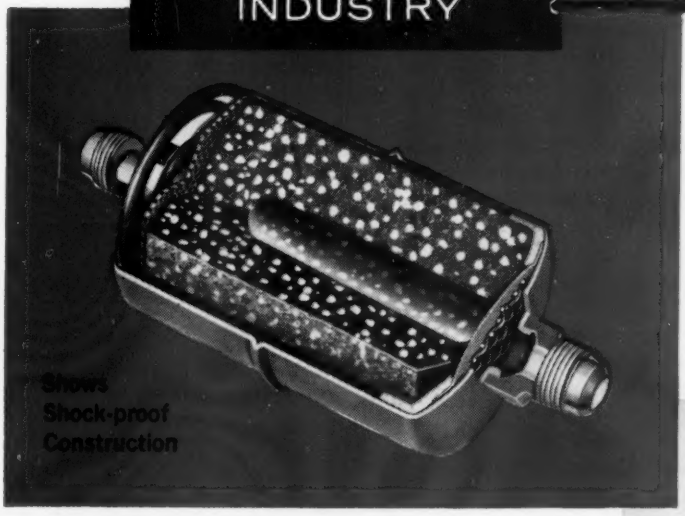

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5. Rigidly controlled activation—factory sealed.
6. Maximum system protection against acids and other foreign matter.
7. Copper (ODS) fittings mean easy brazing.
8. Brass (SAE) fittings means no flare nut creep.
9. Full flow fittings mean low pressure drop.

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The one complete line of refrigerant controls: Thermostatic Expansion Valves • Refrigerant Distributors • Solenoid Valves Refrigerant Filter-Driers • Suction Line Regulators • Flooded Evaporator Controls and Reversing Valves

or replace old cast iron radiators, plumbing or heating offsets of all kinds, alignments of incorrect plumbing or heating rough-ins and replacement of broken plumbing or heating lines. Fittings go around corners, can be bent to two 90 deg els and have a max working pressure of 150 psi. An eight-page bulletin describes and illustrates the product.
Hydro-Flex Corporation, P. O. Box 1165, Topeka, Kansas.

Centrifugal Fans. Included in eight-page Catalog DB2-306 are specifications on the Type B Util-A-Set, direct-connected model, designed to meet the needs of low pressure, small volume, quiet operations; Type FU, belted, for handling a wide range of low volume performance requirements; Type 6S, direct-connected, an extremely compact model for building into machinery which requires air movement, such as electronic tube cooling; Type B, direct-connected, gasoline-driven portable model; and Type B, direct-connected, electric portable.
Ilg Electric Ventilating Company, 2850 N. Pulaski Rd., Chicago 41, Ill.

Wire-Reinforced Rubber Pipe. These specially designed and constructed rubber pipes are made with pipe walls of wire-reinforced, multiple-plied rubber-impregnated fabric embedded in rubber for the full length of the pipe. Smaller pipe sizes in the line (one to three in.) are available with either metal coupling fittings or integral solid molded rubber flanges. Larger sizes (four to twelve in.) are available with integral, solid, full-faced rubber flanges with either 150 or 250 psi drilling steel flanges embedded in the molded rubber flanges.

Covering the line is four-page Bulletin 866, which discusses pipeline noise and vibration; control of noise, vibration and water hammer; and applications, construction features and operating characteristics of the pipe. Tables compare acoustical impedances of Soundzorber pipe with pipe made of various other materials.
General Rubber Corporation, 65 Summit St., Tenafly, N. J.

Transmitting Rotameter. Magnarator, a new through-flow pneumatic transmitting rotameter, is described in six-page Catalog 10A2150. Stating that mounting of the three to fifteen-psig transmitter alongside the metering tube eliminates both the need for an extension and change in direction of the fluid flow, the catalog explains that range, accuracy, predictability, special materials, viscosity immunity and other characteristics of the company's line of rotameters are retained.
Fischer & Porter Company, 716 Jacksonville Rd., Warminster, Pa.

Water Heaters. Subject of an eight-page bulletin are steam injection water heating systems for high or low pressure steam. Eight standard models range up to delivery of 18,000 gph with a 140 F temperature rise or 50,000 gph with a rise of 50 F. Features include steam diaphragm valve, water valve, thermostat, pump, cast iron heater body and pressure relief valve.

Special applications of the heaters are diagrammed and described. Tabular data show capacity for high pressure steam, steam requirements for heating water and dimensions of the various models.
Pick Manufacturing Company, Water Heater Div, West Bend, Wisc.

Temperature Controls. Shown in four-page Catalog G-25 is an extensive line of differential expansion-type temperature controls. Both electric and pneumatic instruments are covered, with units available for temperatures to 2000 F and in a choice of standard, water-tight or explosion-proof enclosures. Included is a general description of their operation with pictures and brief specifications of each model.
Burling Instrument Company, 16 River Rd., Chatham, N. J.

Pump Selector. This pocket-sized unit, designed for accurate, fast pump selection, includes an estimator on the reverse side for calculation of the friction loss in a system to determine the total required head.
Worthington Corporation, Harrison, New Jersey.

Evaporative Condensers. Design features and advantages are presented in eight-page Bulletin 1-A, descriptive of this new line of centrifugal fan, blow-through-type evaporative condensers, ranging in capacity from 15 to 300 ton base rating. Equipment features external sump box for float valve and strainer and V-bottom, free-draining sump tank. Included in the bulletin are dimensional data, selection examples and specifications.
Forseille Products, Inc., P. O. Box 6755, Baltimore 4, Md.

Pin-and-Socket Connectors. Electrical and mechanical characteristics of this multiple connector line are detailed in six-page Bulletin 462-20M-PP-60. Also listed are features of the five types of contacts available in the AMPin-cert line and of connector shells and inserts. A list of accessories available is provided.

Two of the six pages describe the solderless technique (compression-crimp) for connecting the contact to the end of the wire and applicable hand and power crimping tools. Photomacrographs show four standard crimps.
AMP Inc., Harrisburg, Pa.

Welding Fittings. To simplify fabrication of complex piping systems which require traced pipe for conveying products at elevated temperatures to keep them fluid, Traceline welding fittings for aluminum steam traced pipe are discussed in a series of flyers, TL-1, TL-2 and TL-3. Fitting sections are diagrammed and dimensional tables are provided.

Piping is available in 20, 30 and 40-ft lengths and can best be joined by using the Perfect line of couplings. Information on these couplings is presented in Flyer PF-1. Since traced pipe of this type is made in nominal pipe sizes, molded insulations can be utilized.
Alcast Fittings, P. O. Box 151, Claymont, Del.

Sound Control. High velocity air masses from air-operated equipment enter Atomuffler, whose directional vane subdivides the air into smaller streams, dispersing them into a large area expansion chamber. Rebounding freely and with reduced intensity off the walls of this obstruction-free chamber, the air streams collide at a predetermined point, rapidly decelerating while still maintaining full-volume flow.

Further velocity reduction and decibel decay are accomplished by an air cushion generated within the silencing chamber. The spent air then passes through the disseminator in a radial-flow pattern, preventing the occurrence of noise.

Twelve-page Bulletin 609-50-660 describes and illustrates this line of silencers. Tables and charts indicate noise and attenuation levels, dimensions and configurations.
Allied Witan Company, Cleveland 35, Ohio.

Sheetmetal Products. Flexible duct connectors, turning vanes, adjustable air scoops and louvers are among products fabricated by methods detailed in this eight-page bulletin. Descriptive illustrations supplement the text.
Cain Manufacturing, Inc., 1111 N. 5th Ave., P. O. Box 608, Birmingham, Alabama.

Applications

AGGREGATE-DRYING SYSTEM AIDS ASPHALT PRODUCTION

Feature of an automated asphalt production system installed by Suffolk Asphalt Material Corporation, Central Islip, N. Y., is an automatically-controlled aggregate-drying system that provides effective drying regardless of weather. Prior to installation of the new system, production rate varied with weather conditions, falling as much as 50% on wet days.

Developed by Hauck Manufacturing Company, a low-pressure dryer-burner, main part of the system, is used as a complete automatic package. No supervision is needed after start-up and there is virtually no maintenance. Start-up is accomplished by pushing a button and setting the control to the required temperature. Since the burner is synchronized with the control, the flame is self-regulating, decreasing if temperatures rise above the desired level and increasing if they begin to fall.

ALL-ELECTRIC APARTMENT HOUSE UNDER CONSTRUCTION

Park Westwood Tower, a 13-story apartment house under construction in west Los Angeles, will be equipped (by Westinghouse Electric Corporation) with electric heating and air conditioning. Heat pumps will condition air for the building's 144 apartments as needed for comfort, and at the same time dehumidify, filter and circulate the air.

TEN BOOSTER COMPRESSORS USED IN WAREHOUSE

Opened earlier this year at Corpus Christi, Texas, this freezer-storage warehouse contains 1,100,000 cu ft of space, with a blast freezer measuring 110,000 cu ft and three storage rooms, held at –5 F, totaling 990,000 cu ft. The freezer is held at –24 F.

In the refrigerating system five booster compressors (8¾ by 6) and five second-stage units (7 by 7) are connected to a pair of shell-and-tube brine chillers served by three pumps. Total refrigerating capacity of the system, which was manufactured by Frick Company, is approximately 150 ton. Each of the boosters is driven by a 30-hp General Electric motor and the second-stage machines by 50-hp motors. All compressors have automatic capacity controls; they are started and stopped in pairs.

All pipe lines are supported from wall columns. There are separate suction headers, each with coil-type accumulators, from the brine chillers and blast freezers. 70,000 ft of two-in. steel pipe is installed in banks below the ceilings. Three-way modulating valves control flow and temperature. Defrosting is done with warm brine, heated by hot ammonia gas.

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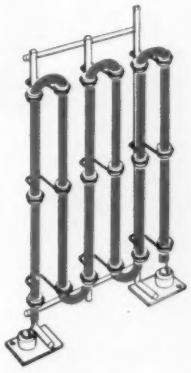

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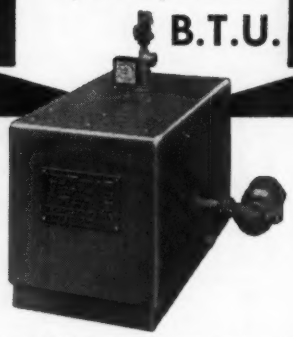

- 40,948 B.T.U. to 2,000,000 B.T.U. Output.
- All units meet the requirements of the ASME Boiler and Pressure Vessel Code.

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- **Complete unit ready for installation** with circulating hot water system and water chiller for year-round air-conditioning.
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- **Every unit tested and inspected.**

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OPENINGS

DESIGN ENGINEER, MECHANICAL—For transport refrigeration unit manufacturer. Automotive, Refrigeration and/or Metal working experience required. Annual sales $4,000,000 with National Distribution. Excellent opportunity for young man looking for challenging position with considerable responsibility and excellent growth potential. Salary commensurate with ability and experience. Please submit detailed resume. Transicold Corp., 1100 S. Taylor Ave., Montebello, Calif.

SALES ENGINEER wanted. Must have experience calling on the cold storage, meat and food processing industries. Reply to: Rigidbilt, Inc., 9240 W. Belmont Ave., Franklin Park, Ill.

SALES ENGINEERS—Excellent opportunities exist in various portions of the U.S. for Branch Managers and Sales Engineers experienced in design and sale of refrigeration systems for industrial applications. Must have knowledge of one or more of the following industries: Meat Packing, Chemical, Frozen Foods and/or Warehousing. Please submit resume, past and desired earnings in complete confidence to: A. W. Bell, Dir. Industrial Rel., Frick Co., Waynesboro, Pa.

ENGINEER SUPERVISOR — Expansion plans requires project engineer. Engineering, contracting firm specializing exclusively in commercial-industrial air conditioning and refrigeration. Complete current experience in design, shop drawings, contract expediting and field supervision necessary. Engineering background preferred, minimum 7 yr experience. Send complete resume to D. B. Ervin, V.P., Air Conditioning, Inc., 2001 Kettner Blvd., San Diego, Calif. or call Belmont 9-2105.

AIR CONDITIONING opportunity. Be your own Boss. Now you can go into a new business, related to air conditioning, with practically no competition. Users of installations everywhere are enthusiastic about the delightful atmospheric conditions achieved under adverse conditions. An expendable product with unique patented equipment provides generous profits from original and repeat sales. If you have initiative and a few dollars there is no limit to possibilities. You receive exclusive franchise and appoint distributors working for you. Write today and tell us about your experience. Box 128, ASHRAE JOURNAL.

DESIGN ENGINEER and Estimator wanted for established builder of environmental test chambers in Southern California. Present employees know of this advertisement. Box 137, ASHRAE JOURNAL.

REFRIGERATION ENGINEER, JR.—Progressive sound commercial refrigerator firm, located 30 miles south of Albany, N. Y., has an opening available for graduate ME with some experience in refrigerator product design. Salary open. Top benefits. Write in full detail stating experience and salary requirements. Box 138, ASHRAE JOURNAL.

ENGINEER—New Challenging opportunity for graduate engineer in rapidly expanding research and development department of prominently nationally known company in the field of air conditioning and refrigeration. Prefer man with sound background in heat transfer and thermodynamics. Please send resumé of experience and qualifications to Box 141, ASHRAE JOURNAL.

SALES MANAGER—50 yr old company with complete line of air conditioning and commercial refrigeration equipment including High and Low Pressure air handling units, coils, evaporative and air cooled condensors, cooling towers and commercial refrigeration coils, has an excellent opportunity for aggressive eastern sales manager. Position calls for ability to work with and establish new manufacturer representatives as well as working with contractors. Home office in convenient New York City location. Box 142, ASHRAE JOURNAL.

SERVICE MANAGER wanted. To assume complete charge of plant service department of growing manufacturer of air conditioning and refrigeration compressors and condensing units. Several years experience in the industry required. Please send resume of experience and qualifications to Box 143, ASHRAE JOURNAL.

REGIONAL SALES MANAGER — National manufacturer seeking aggressive sales engineer experienced in comfort conditioning field preferably hot water heat. Age 30 to 45. B.S.M.E. or comparable work experience. Prefer successful background in promoting sales to architects and engineers at national level. Headquarters Chicago area. Salary open. Our personnel know of this ad. Send resume to Box 144, ASHRAE JOURNAL.

CONSULTING ENGINEER—Seeking an associate to expand in specialized HVAC, Industrial & Commercial fields. Send resume. All replies confidential. Box 146, ASHRAE JOURNAL.

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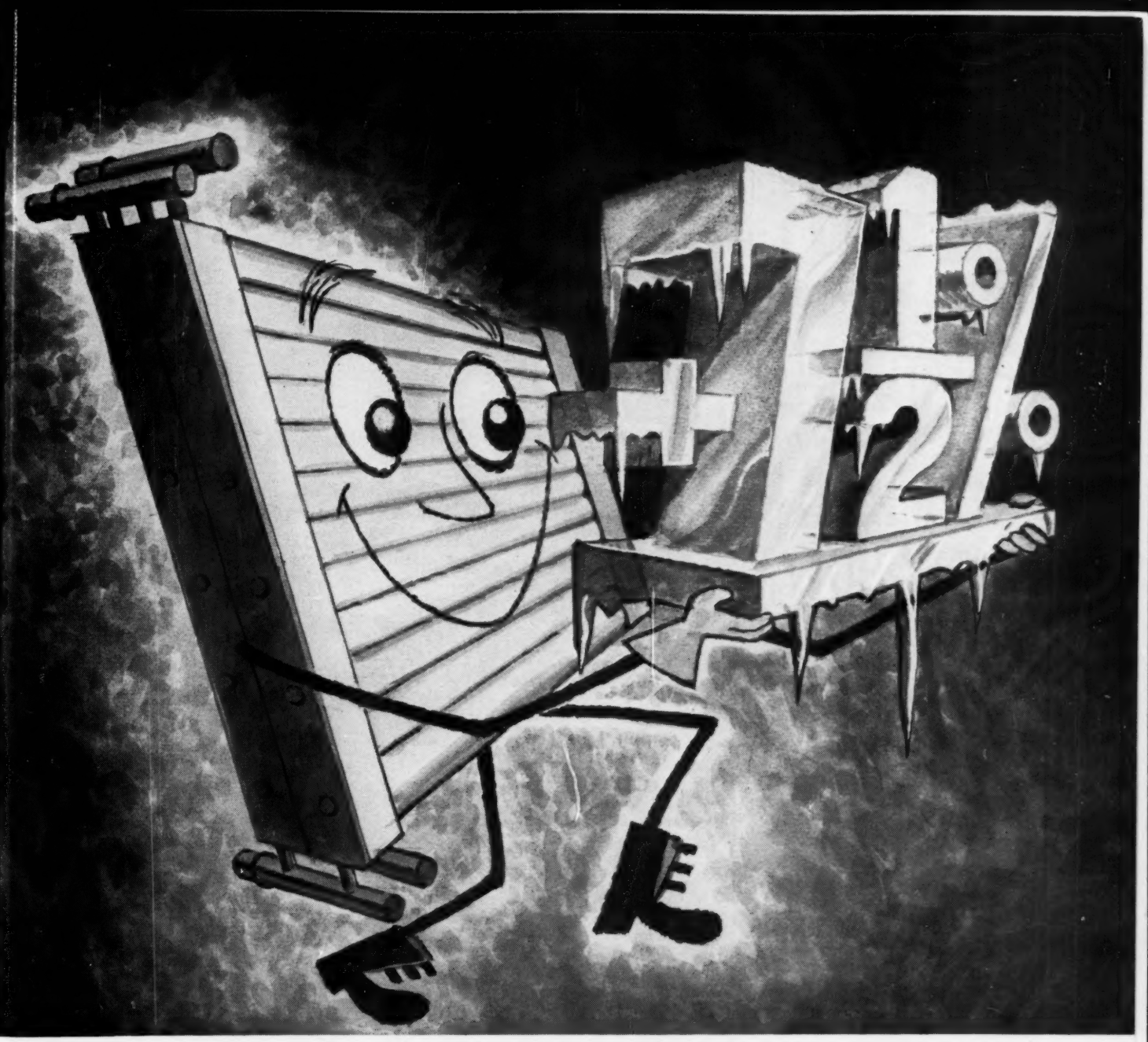

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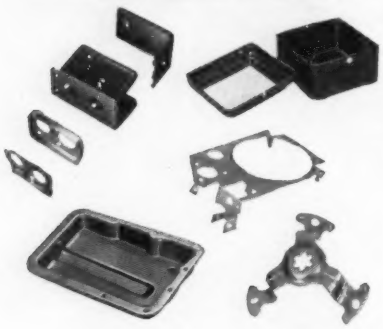

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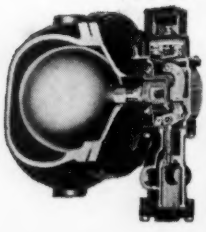

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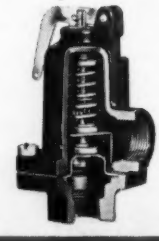

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